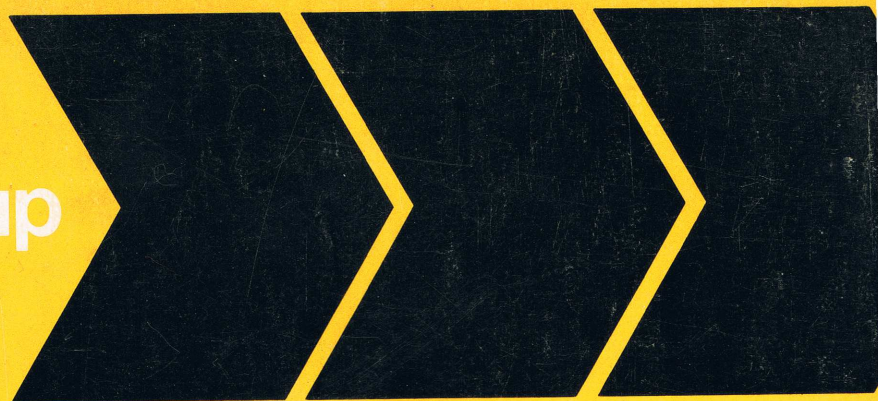


Pay Line Group



Operator's Manual

MODEL 240A

PAY® TRACTOR, AND

PAY® LOADER

FORM

OM-240A

MARCH, 1978



1 085 894 R1 F

An Operator's Manual and a Parts Catalog are packed and shipped with this machine for customer use. Additional technical publications are available for this machine, at a nominal cost, through your authorized International PAY® Line distributor. This material includes Service Manuals and Technical Training Courses.

These additional publications are strongly recommended for the customer who performs his own maintenance and service on this equipment.

It is the policy of International Harvester Company to improve its products whenever it is possible and practical to do so. We reserve the right to make changes or add improvements at any time without incurring any obligation to make such changes on products sold previously.

MODEL 240A
PAY® TRACTOR, AND
PAY® LOADER
FORM
OM-240A
MARCH, 1978

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SECTION INDEX

This manual covers the instructions for operation, lubrication, adjustments and maintenance for normal daily care. These instructions are divided into nine sections to simplify your reference to the information most important to you. Refer to table of contents on next page for a complete list of subjects covered within each section.

This manual has been prepared to help you operate and maintain your machine with utmost efficiency and safety. Read this manual thoroughly and learn your machine before you attempt to operate it.

SECTION 1 – INTRODUCTION

This section discusses generally the use of this manual, serial numbers and how to ship or store this machine.

SECTION 2 – BEFORE STARTING THE NEW MACHINE

This section outlines the special procedures necessary to insure proper "break-in" and care of a new machine.

SECTION 3 – INSTRUMENTS AND CONTROLS

The text and illustrations on instruments and controls in this section are designed to tell you "where it is," "what it does," and "how to use it." Read this section carefully.

SECTION 4 – PREPARING FOR EACH DAY'S WORK

This illustrates the few simple preparations *before* each day's work to assure a work day free of "down time."

SECTION 5 – OPERATING THE MACHINE

This section outlines and illustrates the step-by-step procedures for starting, operating, and stopping the machine.

SECTION 6 – OPERATING TECHNIQUES

A few operating suggestions and techniques are discussed with simple ideas to help ease the work and lengthen the useful life of your machine.

SECTION 7 – SCHEDULED MAINTENANCE

A complete scheduled maintenance procedure is outlined here — one that assures less down-time and expense, and more profit and work from your machine. Read and use this section.

SECTION 8 – MAINTENANCE

Much of the maintenance and adjustment procedures outlined in Section 7 need clear explanation. This section is devoted to explaining the "how to do" in an easy style to help you "do it yourself" and get it right.

SECTION 9 – SPECIFICATIONS AND CAPACITIES

This section covers the capacities, general dimensions and weights, speeds and torques.

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GENERAL

Operation and periodic service instructions for the Model 240A PAY® tractor and PAY® loader are contained in this manual.

Any cross references in this manual are to a specific section of the manual. Refer to the Table of Contents for specific page.

Some illustrations are of general application on this model and may not show your machine accurately in all details.

LEFT and RIGHT indicate the left and right sides of the machine when facing forward in the driver's seat. FRONT indicates the radiator end and REAR indicates the hitch end of the machine.

SAFETY PRECAUTIONS

All industrial units designed to handle large work loads are dangerous when they are not used as intended. Operators of such equipment should, therefore, be careful and acquire safe working habits.

They should also be aware of conditions that could be hazardous. Such knowledge will not

only help an operator to protect himself against accidents, but will also protect other personnel and equipment.

Avoid all safety risks. Safe operation of the machine is, for the most part, an operator responsibility.

SERIAL NUMBERS

Record the machine, engine, and transmission serial numbers for service and parts replacement purposes.

Refer to Figs. 2 and 3 for serial number plate locations.

All other components having serial numbers are each equipped with a separate serial number plate.

Use serial numbers when requesting information or ordering parts. For ready reference, write these serial numbers in the spaces provided below.

Machine Serial Number _____

Engine Serial Number _____

Transmission Serial Number _____



Fig. 1. Model 240A PAY Tractor

INTRODUCTION

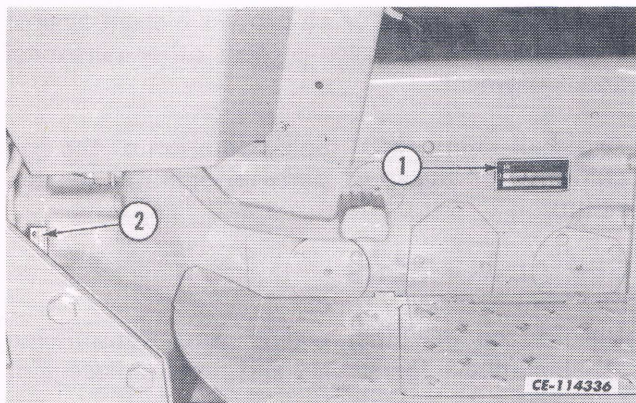


Fig. 2. Transmission and Machine Serial Number Locations

1. Transmission Serial Number
2. Machine Serial Number

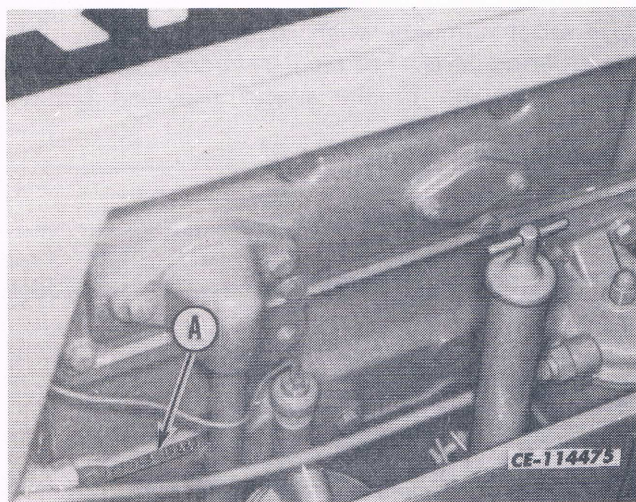


Fig. 3. Engine Serial Number Location

MACHINE TRANSPORT

SHIPPING INSTRUCTIONS

Machines must be empty during transit.

Truck

When shipping the machine by truck, contact the state and/or local authorities for the proper shipping and loading instructions.

If equipped with hydrostatic transmission, refer to "PROCEDURE FOR MOVING HYDROSTATIC DRIVE AFTER TRANSPORTING BY TRUCK OR FLATCAR."

Railroad Flatcar

The loading rules and specifications published by the Association of American Railroads must be followed when shipping this machine on open top railroad cars. Check the manual entitled "RULES GOVERNING THE LOADING OF COMMODITIES ON OPEN TOP CARS."

If equipped with hydrostatic transmission, refer to "PROCEDURE FOR MOVING HYDROSTATIC DRIVE AFTER TRANSPORTING BY TRUCK OR FLATCAR."

Driving

If this machine is to be driven on the highway from one job site to another, contact the state and/or local authorities for loading regulations.

TOWING THE MACHINE

Towing the machine is not recommended as doing so could damage the transmission, differential and axle carrier bearings.

If the machine is disabled and must be towed, refer to "MOVING A DISABLED MACHINE," in this section for specific instructions.

NOTE: Do not tow machine to start engine as this could cause severe damage to the transmission.

PROCEDURE FOR MOVING HYDROSTATIC DRIVE AFTER TRANSPORTING BY TRUCK OR FLATCAR

1. Place the range selector control in "N" (neutral).
2. Latch the brake pedals together. Press down on the brake pedals.
3. Depress the dump valve pedal and start the engine. Set the engine speed control lever to approximately 1000 RPM as shown on the tachometer-hourmeter.
4. Release the dump valve pedal.
5. Slowly move the range selector into "H" (high) position.
6. If gear clash is obvious, shut the engine off immediately and unload the machine by other means.

7. If it becomes necessary to unload the machine by towing, be sure the range lever is in "N" (neutral). The machine should only be towed to the nearest service area to check the transmission. Refer to "MOVING A DISABLED MACHINE" in this section.



CAUTION! Maintain safe control of machine speed and utilize the engine as a brake during downhill operation. Keep the pedal depressed to the desired speed and do not depress the dump valve pedal.

If there is no obvious gear clash, move the range selector to "L" (low) and drive the machine in the normal manner.

MOVING A DISABLED MACHINE

GENERAL

NOTE: *Machines cannot be tow started.*

It is not recommended that a machine be towed a great distance because of safety hazards and possible machine damage. If it becomes necessary to tow a machine, use the following procedures.

When towing is necessary, use a tow rope, chain or cable of adequate strength.

When towing the machine out of a stuck condition, the power of both machines should be used. A steady even pull must be kept on the machine all the time.

HYDROSTATIC TRANSMISSION ONLY

NOTE: *Should it become a necessity to tow a hydrostatic drive equipped machine, the following outlined steps must be adhered to.*

1. A driver must be in the operator's seat to steer the machine and to apply the brakes.
2. Make sure the parking brake is in the off position.
3. The high-low range selector lever must be in the "N" (neutral) position.
4. The engine must be running at approximately 1000 RPM to provide for power steering and transmission lubrication.

If the engine cannot be run, four gallons of IH HY-TRAN® fluid must be added to the transmission case.

After towing the machine, drain added fluid (approximately 15 l (four gallons) so the fluid level is in the area between the arrows on the transmission oil level gauge.

5. Do not tow machine faster than 32 kmph (20 MPH.)

MACHINE STORAGE

When the machine is not to be used for a period of time, store it in a dry and protected place. Leaving equipment outdoors exposed to the elements will materially shorten its life.

An enclosure will protect the machine from rapid temperature changes and lessen the amount of condensation that forms in hydraulic components, engine, and fuel tank. If unable to put machine in an enclosure, cover it with a tarpaulin.

Machined hydraulic cylinder rod surfaces must be coated with IH 251 H or IH 251 HEP grease to protect them from rusting if they are not operated for a period of 15 days or longer. This coating will provide six months protection. However, if the machine is operated and a cylinder is extended and retracted, the coating must be reapplied.

Follow the procedure below when the machine is placed in storage for 30 days or more. Repeat steps 1, 2, 3, 5d, 6 and 9 every six months thereafter. Use caution when starting an engine that has been in storage. Refer to the instructions under "PREPARING STORED MACHINE FOR SERVICE" in this section.

1. Thoroughly wash or clean the machine.
2. Completely lubricate all points of the machine as outlined in "LUBRICATION GUIDE" in Section 7.
3. Drain off the water and sediment from the fuel filters. Refer to "FUEL SYSTEM" in Section 8.

NOTE: *Be sure the fuel tank has at least 37.8 l (10 gallons) of fuel in it.*

4. Service the air cleaner. Refer to "AIR CLEANING SYSTEM" in Section 8.

INTRODUCTION

5. Prepare the engine for storage as follows:

a. Start and run the engine for about 10 minutes. During this time move the machine to the storage location. If equipped, lower the loader bucket onto boards to prevent contact with the ground.

Drain the crankcase oil and change the filter element as described under "ENGINE" in Section 8. Refill the crankcase with fresh oil then run the engine for five minutes.

b. Drain and clean the cooling system. Refer to "COOLING SYSTEM" in Section 8.

c. Refill the cooling system. If the cooling system will be exposed to freezing temperatures during storage, the cooling system must be refilled with an anti-freeze solution while at operating temperature. Select a solution that will be suitable for the lowest temperature the cooling system will be exposed to during storage. If anti-freeze is not a necessity, refill the cooling system with a suitable water and corrosion inhibitor solution. Refer to "COOLING SYSTEM" in Section 8 for the type of coolant specified.

d. Clean and remove the valve housing covers; then flush the valves, rocker arms, and push rods with Grade-30 Series 3 lubricating oil. (Remove any rust before lubricating.) Use a paint brush to coat the inside of the valve housing cover with Grade-30 Series 3 lubricating oil.

e. Remove the injector nozzles. Squirt about 29 ml (one ounce) of Grade-30 Series 3 lubricating oil into each cylinder. Crank the engine two or three revolutions. Clean the nozzle seats and reinstall the injection nozzles.

f. Reinstall and secure the valve housing covers. Refer to "SPECIAL TORQUES" in Section 9.

6. Position all controls and cylinders so that the minimum amount of machined, unpainted surfaces are exposed. Thoroughly coat these surfaces with IH 251 HEP grease.

7. To prevent dirt or moisture from entering the engine, plug up the ends of the exhaust pipe and crankcase breather pipe.

8. Cover the transmission breather with tape to prevent moisture from entering.

9. Remove the battery and store it in a cool dry place above freezing 0° C (+32° F). Tag the battery cables to ensure proper installation. The battery must be fully charged at the time of storage. Check the battery at least once a month for water level and specific gravity. The battery must never be allowed to run down below 3/4 full charge while in storage.

10. Block or tie the clutch pedal (synchromesh transmission) in the fully engaged position. This will keep the clutch facing from sticking to the flywheel or clutch pressure plate.

11. If it is desirable to leave the tires on the machine, jack the machine up and place it on safety stands with the tires in suspension. Deflate and cover the tires.

Stored tires should be clean and protected from light.

NOTE: *If the machine is to be stored under arctic conditions contact: Service Engineering, 600 Woodfield Drive, Schaumburg, Illinois 60172.*

PREPARING STORED MACHINE FOR SERVICE

1. Inflate and install the tires if they were removed. Check inflation pressure. Refer to "TIRES" in Section 8. Remove safety stands if used.

2. Clean the chassis grease from the exposed unpainted surfaces, cylinder rods, valve spools, etc.

3. Install fully charged battery and make the proper cable connections.

4. Remove the coverings from the exhaust pipe, crankcase breather pipe, air cleaner intake pipe and transmission breather opening.

5. Check the cooling system for leaks and loose connections. Be sure the coolant contains a rust inhibitor.

6. Fill the fuel tank with an approved diesel fuel. Refer to "FUEL SYSTEM" in Section 8 for fuel specifications.

7. Be sure that the grade of oil in the engine crankcase is according to the temperature range as specified in the "LUBRICANT SPECIFICATIONS AND CAPACITIES CHART" in Section 7.

8. Remove the engine valve housing covers and flush the valve and valve operating mechanism with a mixture of one-half kerosene and one-half Grade-10 oil.



CAUTION! Keep the doors wide open or move the machine outside the storage room immediately to avoid danger from exhaust gas. Do not accelerate the engine rapidly or operate it at high speed immediately after starting.

9. Start the engine and let it run slowly. After the engine has started, observe if any valves are sticking. If so, pour a small quantity of diesel fuel on the valve stems until loose. If the engine is misfiring or loss of power is evident after starting the engine, the fuel system is possibly clogged or has air in it. (Refer to "FUEL SYSTEM" in Section 8 for filter changing and venting procedure.)

10; Install and secure the valve housing covers. Refer to "SPECIAL TORQUES" in Section 9.

11. Allow the engine to run for 5 to 10 minutes to allow thorough distribution of the lubricating oil. Do not place the engine under load until normal oil pressure is reached.

INTRODUCTION

UNIVERSAL SYMBOLS FOR INSTRUMENTS AND CONTROLS

The International Harvester Company is using universal symbols to pictorially identify various instruments and controls. These symbols are an effort to overcome language differences for all operators in a positive way, thus enhancing their safety through quicker recognition of the instru-

ments and controls while operating the equipment.

Study the following symbols so you will know their meaning immediately and at a glance.











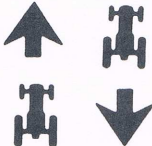
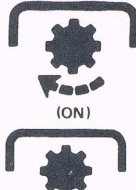
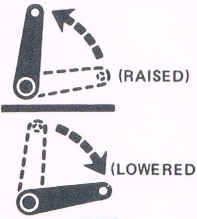




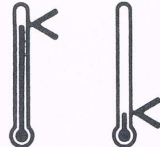


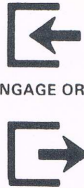
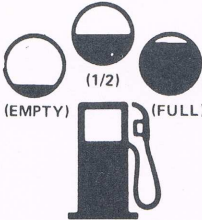

					
CAUTION	TRANSMISSION	DIPSTICK	GENERATOR LIGHT OR AMMETER	SPEED RANGE	TRANSMISSION OIL PRESSURE
					
CAUTION! PRESSURIZED OPEN SLOWLY	ENGINE RPM	ENGINE OIL PRESSURE	WATER TEMPERATURE	FORWARD REVERSE	POWER TAKE-OFF
					
ROCKSHAFT	NEUTRAL	TRANSMISSION OIL TEMPERATURE	HOURS	HORN	TEMPERATURE
					
POSITIVE, OR INCREASE NEGATIVE OR DECREASE SIGN	DIFFERENTIAL LOCK	(ENGAGE OR IN) (DISENGAGE OR OUT) ENGAGEMENT	(EMPTY) (1/2) (FULL) FUEL	(ENGAGED) HAND BRAKE	

Fig. 4. Universal Symbols

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INITIAL SERVICE PROCEDURE

BEFORE STARTING THE ENGINE

1. Fill the fuel tank with clean fuel, free of water and other contaminants. Refer to "FUEL SYSTEM" in Section 8 for fuel specifications.
2. Be sure the three fuel shutoff valves (A, Fig. 1) are open.

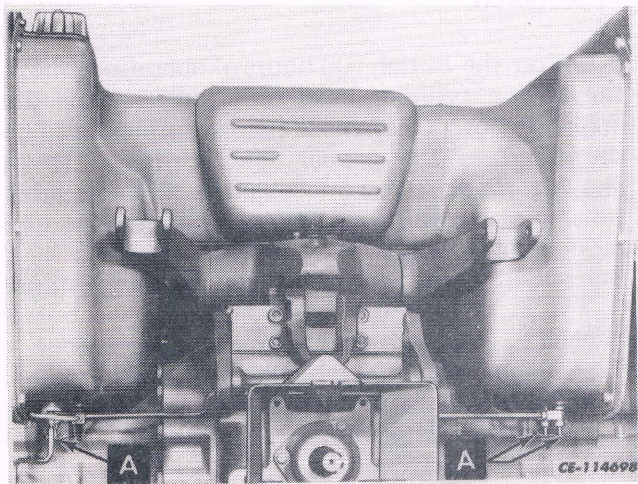


Fig. 1. Fuel Shutoff Valves

3. Be sure the cooling system is filled to the proper level. Refer to "COOLING SYSTEM" in Section 8.

The cooling system has been filled with permanent anti-freeze solution to prevent freezing to -28.8°C (-20°F) in the United States and -40°C (-40°F) in Canada.

4. Check the battery liquid level. Refer to "ELECTRICAL SYSTEM" in Section 8.
5. Be sure the battery terminals are clean and the battery cables are fastened securely to the correct terminals. Refer to "ELECTRICAL SYSTEM" in Section 8.
6. Be sure the terminals on the back of the alternator are clean and the harness connector (1, Fig. 2) is fastened securely with the retainer (2).

7. Check the oil levels in the different compartments for lubricant. Refer to "LUBRICATION WHEN SHIPPED" in this section. For procedures, refer to Section 7.

8. Make sure the air cleaner filter element is in place. Refer to "AIR CLEANING SYSTEM" in Section 8.

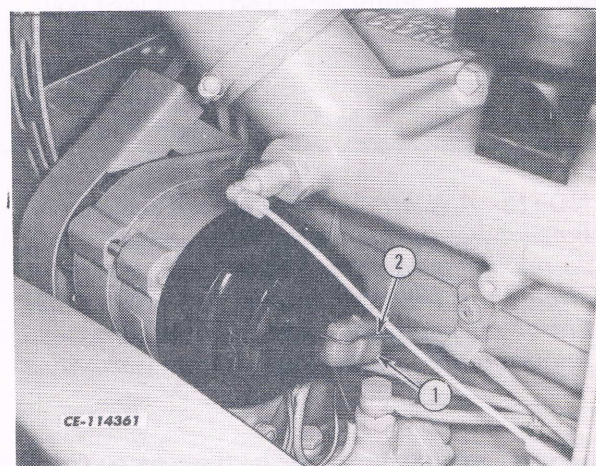


Fig. 2. Alternator Connections

1. Alternator harness connector
2. Retainer

BEFORE OPERATING THE MACHINE

1. Lubricate the entire machine. Refer to "LUBRICATION GUIDE" in Section 7.
2. Check tire inflation pressures. Refer to "TIRES" in Section 8.
3. Never operate the engine at a full load immediately. Break it in carefully as shown in the table. Do not overload engine at any time and do not idle engine for prolonged periods. Allow engine to warm up before operating at full load.

BEFORE STARTING THE NEW MACHINE

Period	Engine Speed Control Lever Position	Load
1st 15 Minutes	Low idle	No load
1st Hour	Fully advanced	Maintain engine speed 100 RPM above full load governed speed.
2nd Through 5th Hours	Fully advanced	Full load governed speed with occasional short periods of lighter load.

NOTE: Any attempt to increase the engine horsepower by increasing RPM above its rated maximum, or by any other means not only affects the traveling speeds, but affects the life of matching parts and voids the company responsibility as outlined in the warranty.

INITIAL MAINTENANCE PROCEDURES

1. Check the alternator belt tension at 1, 10 and 50 hour intervals until the tensions remain stabilized. Thereafter, adjust at the interval specified in the "SCHEDULED MAINTENANCE GUIDE" in Section 7. Refer to "BELTS" in Section 8.

2. The engine crankcase is filled at the factory with shipaway oil. This oil must be changed after the initial 100 hours of operation. Oil added during the first 100 hours must be CD or MIL-L-2104C of the proper viscosity grade for temperature as specified in "LUBRICANT SPECIFICATIONS AND CAPACITIES CHART." Refer to "LUBRICANT SPECIFICATIONS AND CAPACITIES CHART" in Section 7 and "ENGINE" in Section 8.

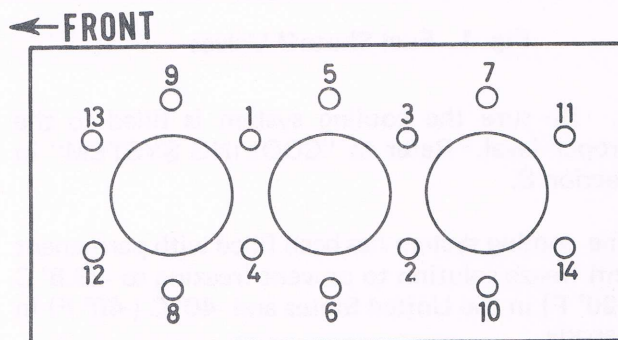
3. After the initial 10, 100 and 200 hours of operation clean the hydraulic system filter by-pass screen and replace the element. Thereafter, service at the interval specified in the "SCHEDULED MAINTENANCE GUIDE" in Section 7. Refer to "HYDRAULIC SYSTEM" in Section 8 for service procedures.

4. Check wheel bolt torque after the initial 10 hours of operation. Refer to "SPECIAL TORQUES" in Section 9.

5. If equipped with hydrostatic drive, clean the drive housing bypass valve screen and replace the filter and gasket after the initial 1, 50, 100 and 200 hours of operation. Thereafter, service as specified in "SCHEDULED MAINTENANCE GUIDE." Refer to "HYDRAULIC SYSTEM" in Section 8.

6. After the initial 100 hours of operation, check the engine cylinder head bolt torque while the engine is hot. Only those below torque are to be retorqued to the proper specification. Those above torque are to remain as they are. For most satisfactory results in tightening, follow the sequence in Fig. 3. Refer to "SPECIAL TORQUES" in Section 9 for correct torque.

NOTE: Be sure to adjust the valve tappet clearance after tightening the cylinder head bolts. Refer to "ENGINE VALVES" under "ENGINE" in Section 8.



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Fig. 3. Sequence for Torquing Engine Head

7. After the initial 100 hours of operation, adjust the engine valve lash. Refer to "ENGINE" in Section 8. Thereafter adjust as specified in the "SCHEDULED MAINTENANCE GUIDE" in Section 7.

LUBRICATION WHEN SHIPPED

Machines shipped to destinations in United States of America, Canada and Mexico have the engine crankcase filled with shipaway oil and the main reservoir filled with IH Hy-Tran Fluid.

BEFORE STARTING THE NEW MACHINE

SECTION 2
Page 3

This machine is lubricated at the factory for operation in an air temperature range of -28° C (-20° F) to 43° C (110° F).

If the machine is to be operated above or below this range, change to the correct coolants and lubricants.

Unless noted under "INITIAL MAINTENANCE PROCEDURES," all lubricants can be used (within the above temperature range) until regular scheduled (normal) change intervals occur.

Refer to "SERVICE GUIDES" in Section 7 for the scheduled (normal) change intervals and to "LUBRICANT SPECIFICATIONS AND CAPA-

CITIES" in Section 7 for proper oil grades for the various air temperatures.

COMPARTMENT	LUBRICANT
CRANKCASE	EO *
MAIN RESERVOIR (Common reservoir for transmission, loader hydraulics, brake and differential)	IH HY-TRAN FLUID *

*Refer to "INITIAL MAINTENANCE PROCEDURES" in this section.

This section covers the location and function of the various instruments and controls of this machine. In the case of controls, more detailed information regarding the operation can be found in Section 5.

Regardless of previous experience as an operator, you must be thoroughly familiar with the location and use of all instruments and controls before operating this machine.

NOTE: Each reference number in the figures of this section has a corresponding reference number and explanation in the text.

NOTE: Check all instruments immediately after starting, again upon reaching operating temperature and at frequent intervals during operation. The values or ranges shown in the legend are with normal operating temperature and engine at high idle speed. Each instrument must register within the range specified for safe correct operation. If they do not, stop the engine; locate and correct the cause immediately.

HYDROSTATIC TRANSMISSION WITH HAND CONTROL (PAY TRACTOR ONLY)

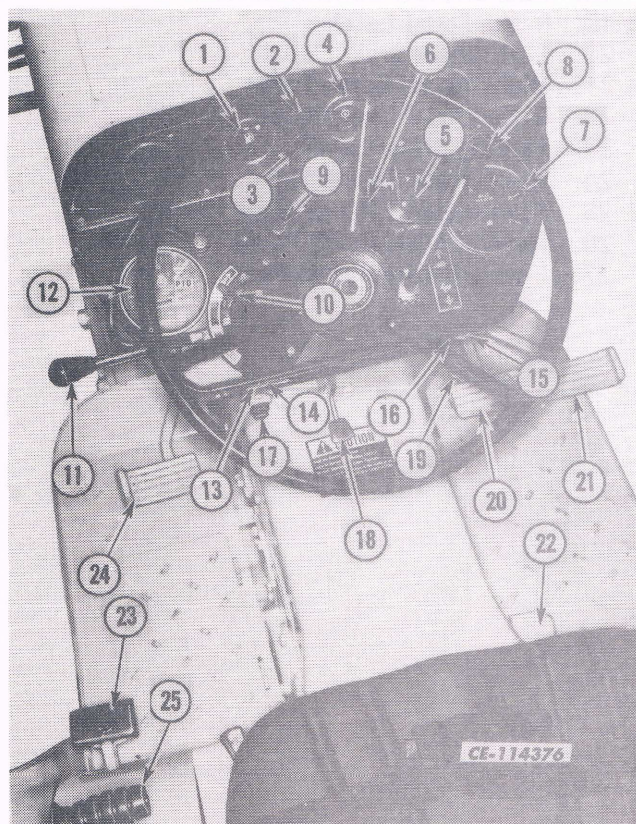


Fig. 1. Instruments and Controls For Machines Equipped with Hydrostatic Transmission With Hand Controls

1. Fuel Level Gauge
2. Transmission Temperature Warning Light (must be off)
3. Parking Brake Warning Light (must be on when parking brake is applied)
4. Engine Coolant Temperature Gauge (pointer must register in center of the gauge)
5. Turn Signal Switch
6. Alternator Warning Light (must be off)
7. Speedometer
8. Engine Speed Control Lever
9. Engine Oil Pressure Warning Light (must be off)
10. Adjustable Stop
11. Forward/Reverse Directional Lever
12. Tachometer/Hourmeter
13. Light Switch
14. Cigarette Lighter (if equipped)
15. Key Ignition Switch
16. Horn Button (if equipped)
17. Ether Start Button
18. Fuel Shutoff Control Lever
19. Brake Pedal Latch
20. Left Wheel Brake Pedal
21. Right Wheel Brake Pedal
22. Differential Lock Pedal
23. Parking Brake Lever
24. Hydrostatic Dump Pedal
25. Transmission Range Shift Lever

INSTRUMENTS AND CONTROLS

HYDROSTATIC TRANSMISSION WITH FOOT CONTROLS

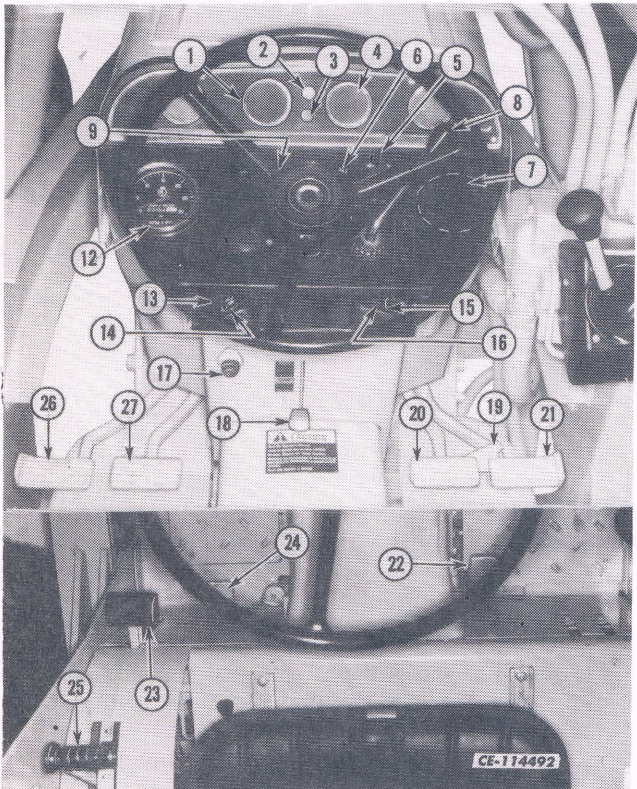
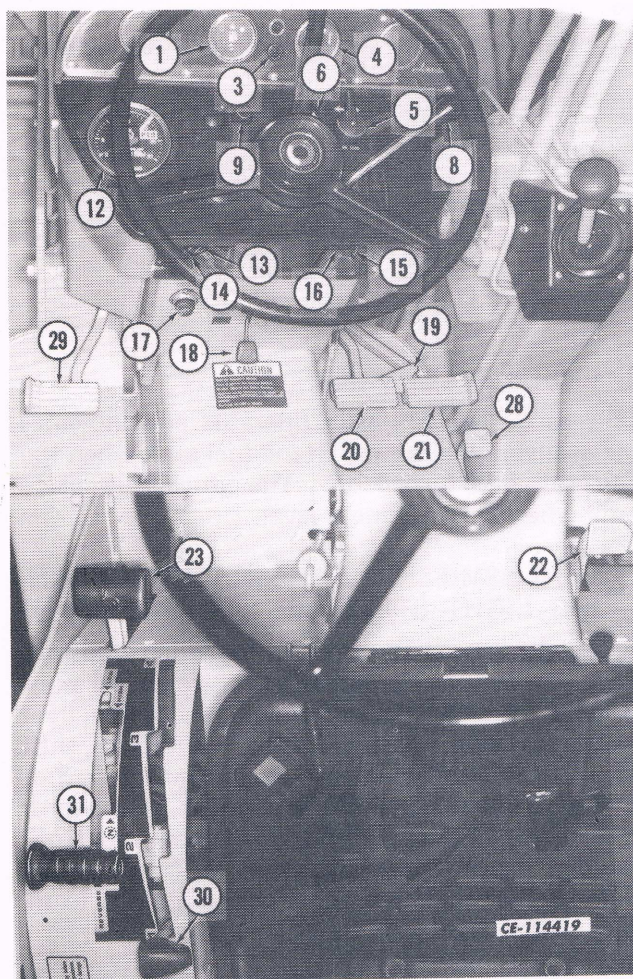


Fig. 2. Instruments and Controls For Machines Equipped With Hydrostatic Transmission With Foot Controls

1. Fuel Level Gauge
2. Transmission Temperature Warning Light (must be off)
3. Parking Brake Warning Light (must be on when parking brake is applied)
4. Engine Coolant Temperature Gauge (pointer must register in center of gauge)
5. Turn Signal Switch
6. Alternator Warning Light (must be off)
7. Speedometer (if equipped)
8. Engine Speed Control Lever
9. Engine Oil Pressure Warning Light (must be off)
12. Tachometer/Hourmeter
13. Light Switch
14. Cigarette Lighter (if equipped)
15. Key Ignition Switch
16. Horn Button (if equipped)
17. Ether Start Button
18. Fuel Shutoff Control Lever
19. Brake Pedal Latch
20. Left Wheel Brake Pedal
21. Right Wheel Brake Pedal
22. Differential Lock Pedal
23. Parking Brake Lever
24. Hydrostatic Dump Pedal
25. Transmission Range Shift Lever
26. Reverse Directional Pedal
27. Forward Directional Pedal

SYNCHROMESH TRANSMISSION



1. Fuel Level Gauge
3. Parking Brake Warning Light (must be on when parking brake is applied)
4. Engine Coolant Temperature Gauge (pointer must register in center of gauge)
5. Turn Signal Switch
6. Alternator Warning Light (must be off)
8. Engine Speed Control Lever
9. Engine Oil Pressure Warning Light (must be off)
12. Tachometer/Hourmeter
13. Light Switch
14. Cigarette Lighter (if equipped)
15. Key Ignition Switch
16. Horn Button (if equipped)
17. Ether Start Button
18. Fuel Shutoff Control Lever
19. Brake Pedal Latch
20. Left Wheel Brake Pedal
21. Right Wheel Brake Pedal
22. Differential Lock Pedal
23. Parking Brake Lever
28. Foot Accelerator Pedal
29. Clutch Pedal
30. Transmission Speed Shift Lever
31. Transmission Range and Reverse Shift Lever

Fig. 3. Instruments and Controls For Machines Equipped With Synchromesh Transmission

TORQUE CONVERTER TRANSMISSION

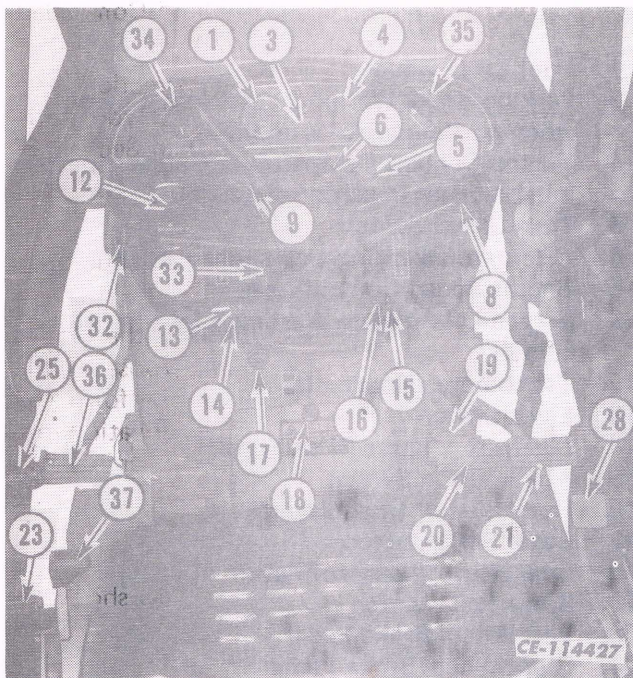


Fig. 4. Instruments and Controls For Machines Equipped With Torque Converter Transmission

1. Fuel Level Gauge
3. Parking Brake Warning Light (must be on when parking brake is applied)
4. Engine Coolant Temperature Gauge (pointer must register in the center of gauge)
5. Turn Signal Switch
6. Alternator Warning Light (must be off)
8. Engine Speed Control Lever
9. Engine Oil Pressure Warning Light (must be off)
12. Tachometer/Hourmeter
13. Light Switch
14. Cigarette Lighter (if equipped)
15. Key Ignition Switch
16. Horn Button (if equipped)
17. Ether Start Button
18. Fuel Shutoff Control Lever
19. Brake Pedal Latch
20. Left Wheel Brake Pedal
21. Right Wheel Brake Pedal
22. Differential Lock Pedal (Not Illustrated)
23. Parking Brake Lever
25. Transmission Range Shift Lever

28. Foot Accelerator Pedal
32. Forward-Reverse Directional Control Lever
33. Neutral Lock Lever
34. Clutch Pressure Gauge (pointer must register in green area)
35. Torque Converter Oil Temperature Gauge (pointer must register to right of gauge center)
36. Torque Converter Dump Pedal
37. Transmission Speed Shift Lever.

1. FUEL LEVEL GAUGE

This gauge is electrically operated and indicates the available fuel supply in the fuel tank when the key switch is turned on. The gauge is accurate only when the machine is level.

2. TRANSMISSION TEMPERATURE WARNING LIGHT (Hydrostatic Transmission Only)

This light is used to give warning when transmission temperature becomes excessive or oil pressure is low. If the transmission warning light comes on under heavy work load conditions, shift into "LOW" range or ease up on the forward or reverse control pedal (foot control) or forward/reverse directional control lever (hand control). (Under heavy load conditions it is important that engine rated load RPM be maintained to insure proper cooling.)

If the light stays on, be sure the dump valve pedal is fully released or in full up position. Also check the transmission oil cooler and radiator to insure that air flow is not restricted by an accumulation of chaff or debris. If the light stays on after checking and correcting the above, see your International PAY® line distributor.

NOTE: Do not continue to operate the machine if the transmission warning light stays on!

3. PARKING BRAKE WARNING LIGHT

NOTE: Do not drive the machine with the parking brake applied.

This light will be on when the parking brake is applied.

4. ENGINE COOLANT TEMPERATURE GAUGE

This gauge shows the temperature range of the coolant circulating through the engine. After the engine has operated a sufficient length of time, the pointer must be near the vertical center of the gauge and must remain there during regular operation.

5. TURN SIGNAL SWITCH

Turn the switch right to activate the right turn signal, turn to left to activate the left turn signal. The switch must be returned to the off position manually.

6. ALTERNATOR WARNING LIGHT

This light will come on when the alternator is not recharging the battery.

7. SPEEDOMETER (Hydrostatic Transmission Only) (If Equipped)

This gauge registers the speed which the machine is traveling in mph (miles per hour).

8. ENGINE SPEED CONTROL LEVER

This lever controls the engine speed. Pull the lever down to increase engine speed. Push the lever forward to decrease engine speed.

9. ENGINE OIL PRESSURE WARNING LIGHT

This light will come on if the engine oil pressure is too low.

NOTE: If this light comes on, stop the engine immediately to prevent damage to it. Do not operate the engine again until the problem is corrected.

10. ADJUSTABLE STOP (PAY Tractor With Hand Controlled Hydrostatic Transmission Only)

This stop is used in the forward direction to enable the forward/reverse directional lever to be returned to the same operating position. The lever can be moved past the stop if the need arises.

11. FORWARD/REVERSE DIRECTIONAL LEVER (PAY Tractor With Hand Controlled Hydrostatic Transmission Only)

This lever is used to select machine direction. Refer to "DRIVING THE MACHINE (Hydrostatic Transmission With Hand Control)" in Section 5.

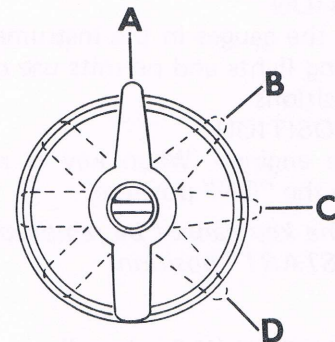
12. TACHOMETER/HOURMETER

The tachometer indicates engine speed in hundreds of RPM.

The hourmeter electrically records the actual hours of engine operation. The purpose of the hourmeter is to indicate when to perform the recommended maintenance and lubrication operations. The hourmeter will register only when the engine is running.

13. LIGHT SWITCH

The light switch has four positions as shown in Fig. 5.



CE-110715

Fig. 5. Light Switch Positions

- A. "OFF" Position
- B. Warning Lights
- C. Warning Lights, Instrument Lights, Headlights and Tail Lights
- D. Instrument Lights, Headlights and Front and Rear Flood Lights

14. CIGARETTE LIGHTER (If Equipped)

Push the knob in all the way. The lighter will automatically return when ready for use.

15. KEY IGNITION SWITCH (Fig. 6)

This three position switch is used to start the engine.

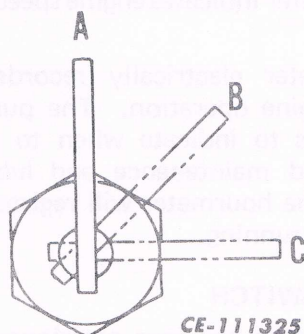


Fig. 6. Key Ignition Switch Positions

A. OFF POSITION

B. ON POSITION

Activates the gauges in the instrument panel, the warning lights and permits use of lighting switch positions.

C. START POSITION

Starts the engine. When key is released it returns to the "ON" position.

NOTE: The key cannot be removed in the "ON" or "START" position.

16. HORN BUTTON (If Equipped)

Depress the button to sound horn.

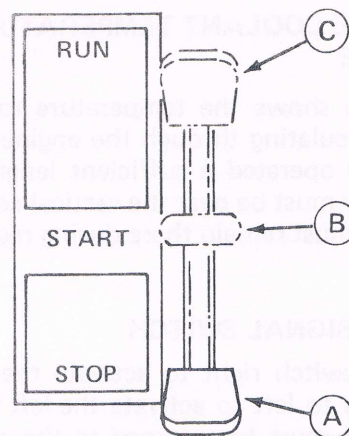
17. ETHER START BUTTON

This button controls the ether injector for cold weather starting. When this button is pressed a measured amount of ether is injected into the engine. Refer to "STARTING THE ENGINE" in Section 5.

NOTE: Ether can be injected only when the engine is not running.

18. FUEL SHUTOFF CONTROL LEVER (Fig. 7)

This lever is used to control the injection pump when starting, running and stopping the engine. Refer to "STARTING THE ENGINE" and "STOPPING THE ENGINE" in Section 5.



CE-114347

Fig. 7. Fuel Shutoff Control Lever Position

- A. Stop
- B. Start
- C. Run

19. BRAKE PEDAL LATCH

Connect the brake pedals together with this latch to have the brakes operate simultaneously when either pedal is depressed. Disconnect the latch from the pedals to have the left and right brakes operate independent of each other. Refer to "STOPPING THE MACHINE" and "STEERING THE MACHINE" in Section 5.



CAUTION! Always latch the brake pedals together when roading the machine or when in high gear. Be sure brakes are properly adjusted.

20. LEFT WHEEL BRAKE PEDAL

This pedal is used to apply the left wheel brake when stopping the machine or when making a brake assisted sharp left turn. Refer to "STOPPING THE MACHINE" and "STEERING THE MACHINE" in Section 5.

21. RIGHT WHEEL BRAKE PEDAL

This pedal is used to apply the right wheel brake when stopping the machine or when making a brake assisted sharp right turn. Refer to "STOPPING THE MACHINE" and "STEERING THE MACHINE" in Section 5.

22. DIFFERENTIAL LOCK PEDAL

The machine is equipped with a differential lock that will turn both rear wheels at the same speed, preventing the usual loss of traction when one wheel slips. It is intended for off-road use.

When one wheel starts to slip, engage the differential lock by depressing the operating pedal.

The lock will remain engaged until the pedal is released. The front wheels should be in the straight ahead position when engaging or disengaging the differential lock.

NOTE: *The differential lock must be disengaged before making a turn.*

Refer to "OPERATING THE DIFFERENTIAL LOCK" in Section 5.

23. PARKING BRAKE LEVER (Fig. 8)

CAUTION! The parking brake should always be applied when the operator is not in the driver's seat.

The parking brake is used to lock the transmission after the machine is stopped. This prevents the machine from moving. Pull the handle up to engage. Release the latch under the handle and push down to disengage.

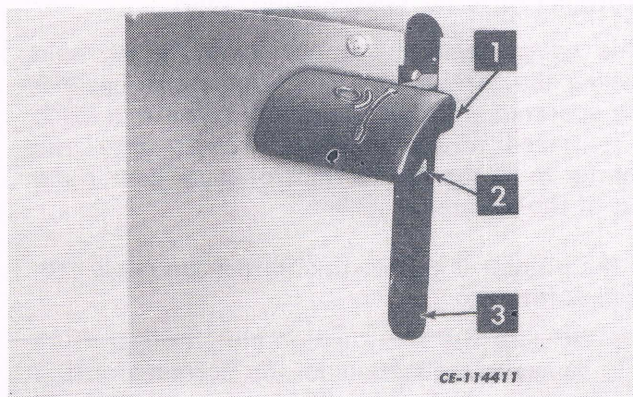


Fig. 8. Parking Brake Lever

1. Engaged
2. Release Latch
3. Disengaged

The parking brake warning light will be on when the parking brake is applied and the ignition switch is on.

NOTE: *Do not drive the machine with the parking brake engaged.*

24. HYDROSTATIC DUMP PEDAL (Hydrostatic Transmission Only)

This pedal completes the cranking motor circuit when fully depressed. It also neutralizes the transmission to prevent any possible movement of the machine while starting the engine. This pedal is also used to make sudden or emergency stops when applied simultaneously with the brake pedals.

25. TRANSMISSION RANGE SHIFT LEVER (Hydrostatic and Torque Converter Transmissions Only)

This lever is used to select either "HIGH" or "LOW" range or "N" (neutral) position for the range transmission located in the rear frame. Drive power cannot be transmitted to the rear wheels when in neutral.

The dump pedal must be depressed before shifting this lever on torque converter transmission. On hydrostatic transmission, the forward/reverse directional lever (hand control) or forward/reverse pedals (foot controls) must be in neutral position or the dump pedal must be depressed. Refer to "DRIVING THE MACHINE" in Section 5.

NOTE: *Never shift the range lever when the machine is moving.*

26. REVERSE DIRECTIONAL PEDAL (Hydrostatic Transmission With Foot Control Only)

This pedal controls rearward movement of the machine, travel speed and torque to the rear wheels. Refer to "OPERATING THE HYDROSTATIC TRANSMISSION WITH FOOT CONTROLS" in Section 5.

27. FORWARD DIRECTIONAL PEDAL (Hydrostatic Transmission With Foot Control Only)

This pedal controls forward movement of the machine, travel speed and torque to the rear wheels. Refer to "OPERATING THE HYDROSTATIC TRANSMISSION WITH FOOT CONTROLS" in Section 5.

28. FOOT ACCELERATOR PEDAL (Synchromesh and Torque Converter Transmissions Only)

This pedal is used to increase or decrease engine and machine speed. Depress the pedal to increase the speed of the engine. The engine speed control lever should be retarded when the pedal is used.

INSTRUMENTS AND CONTROLS

29. CLUTCH PEDAL (Synchronesh Transmission Only)

This pedal is used to engage or disengage the clutch. Depress the pedal to disengage and release the pedal to engage. The pedal is equipped with a neutral start switch to prevent starting the engine unless the pedal is depressed.

30. TRANSMISSION SPEED SHIFT LEVER (Synchronesh Transmission Only)

This lever is used to select one of four speeds. It is used along with the transmission range shift lever to select one of eight available forward speeds or four available reverse speeds. Refer to "SHIFTING THE RANGE AND SPEED LEVERS" under "DRIVING THE MACHINE" in Section 5.

31. TRANSMISSION RANGE AND REVERSE SHIFT LEVER

(Synchronesh Transmission Only)

This lever has four positions; LOW, HIGH, NEUTRAL and REVERSE. Refer to "SHIFTING THE RANGE AND SPEED LEVERS" under "DRIVING THE MACHINE" in Section 5.

32. FORWARD/REVERSE CONTROL LEVER

(Torque Converter Transmission Only)

This lever controls the machine direction. Push the lever forward for forward direction. Pull back for reverse direction. Refer to "SHIFTING THE RANGE, SPEED AND FORWARD/REVERSE CONTROL LEVERS" under "DRIVING THE MACHINE" in Section 5.

33. NEUTRAL LOCK LEVER

(Torque Converter Transmission Only)

The neutral lock lever has two positions. When in the down position, with the notch in the lever over the pin on the instrument panel, the forward/reverse control is secured in "N" (neutral) position. When in the raised position, the forward/reverse lever can be moved up or down. This lever is used to prevent engagement of the transmission under certain conditions, such as while the backhoe is being operated.

34. CLUTCH PRESSURE GAUGE

(Torque Converter Transmission Only)

This gauge registers the oil pressure in the transmission forward/reverse clutch pack. When the

forward/reverse shift lever is in "N" (neutral) or disengaged position, the pointer must register in the yellow (neutral) area. When the lever is in forward or reverse (engaged) position, the pointer must register in the green (engaged) area.

If the pointer registers in the yellow area when the lever is engaged, insufficient oil pressure is being supplied to the clutch pack. This may be due to a problem in the charging system and may cause damage to the clutch plates due to slippage.

If the pointer remains in the green area after the lever has been moved to "N" (neutral) position, the clutch pack may not be disengaged and the machine may continue to move.

If either of these conditions occur, check and be sure the forward/reverse lever is fully in "N" (neutral) position and the dump pedal is fully up. It may be necessary to operate the lever and pedal to relieve a stuck spool in the control and modulation valve.

If the pointer continues to register incorrectly, stop the engine and determine the cause. Do not operate the machine until the problem has been corrected.

35. TORQUE CONVERTER OIL TEMPERATURE GAUGE

(Torque Converter Transmission Only)

This gauge registers the temperature of fluid leaving the torque converter. After the machine has operated a sufficient amount of time to reach a stabilized torque converter temperature, the pointer must register to right of gauge center and out of the red area.

If the pointer is out of the normal run range proceed as follows:

- a. Be sure the transmission clutch oil pressure gauge is registering in the correct pressure range. Refer to "CLUTCH PRESSURE GAUGE" in this section.
- b. Check the hydraulic fluid level. Refer to "HYDRAULIC SYSTEM" in Section 8.

If the pointer moves into the red area during operation, refer to "CONVERTER OVERHEATING" under "DRIVING THE MACHINE (Torque Converter Transmission)" in Section 5.

36. TORQUE CONVERTER DUMP PEDAL

(Torque Converter Transmission Only)

Depress the dump pedal completely to activate

the neutral start switch and complete the engine cranking circuit. This enables the engine to be started with the transmission in a neutralized condition.

Partially depress the dump pedal to neutralize the transmission so the speed shift lever and range shift lever can be shifted. A speed shift can be made while the machine is moving; a range shift must be made with the machine stopped.

NOTE: *Do not fully depress the pedal when using in this function. Doing so will apply the brakes and cause them to wear at a faster than normal rate.*

Completely depress the dump pedal to activate the brakes and hold the tractor still while operating the loader.

NOTE: *This feature is not intended to replace normal operation of the brake pedals. It is intended only for the above stated function.*

37. TRANSMISSION SPEED SHIFT LEVER (Torque Converter Transmission Only)

This lever is used to select one of three speeds. It is used along with the transmission range shift lever to select one of the six available forward speeds or three available reverse speeds. The dump pedal or forward/reverse control lever must be in neutral position before shifting this lever. Refer to "SHIFTING GEARS, TORQUE CONVERTER TRANSMISSION" in Section 5.

LOADER CONTROLS

LOADER CONTROL LEVER (Fig. 9)

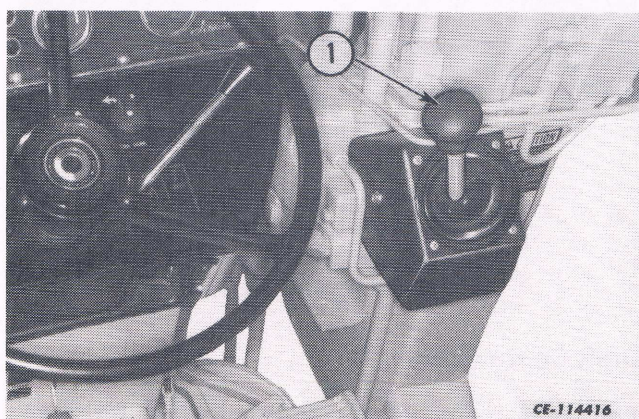


Fig. 9. Loader Control Lever

The lever is used to raise or lower the boom and roll back or dump the bucket. Refer to "OPERATING THE LOADER" in Section 5.

A hydraulic self leveling unit on the loader mechanism will maintain the bucket attitude as it is being raised.

BUCKET LEVEL INDICATOR (FIG. 10)

The loader has an indicator on the outside of the right boom which enables the operator to see when the bucket is level.

The bucket bottom is parallel with the ground when the indicator rod (1) is flush (A) with the top of the bracket (2).

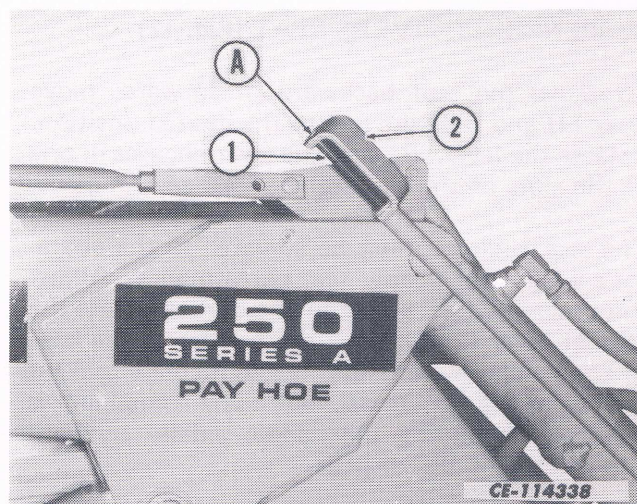


Fig. 10. Bucket Level Indicator (Typical Illustration)

1. Indicator Rod
2. Bracket

SEAT CONTROLS

CUSHIONED DRIVERS SEAT (Fig. 11)

Move the adjusting lever (1). Slide the seat backward or forward to the desired position and release the lever. Be sure the lever engages in one of the slots of the slide rail to lock seat in place.



Fig. 11. Cushioned Drivers Seat Adjustment Control

SUSPENSION DRIVERS SEAT (Fig. 12)

To move the seat backward or forward, move lever (1) and slide the seat to the desired position. Release the lever. Be sure the lever engages in one of the slots of the slide rail to lock seat in place.

The seat preload must be adjusted to the operator's weight for proper seat performance. Adjust the preload while sitting in the seat. Operate the ratchet lever (2) to move the pointer at the base of the handle toward the "+" to increase preload or toward the "-" to decrease. The adjustment is reversed by pulling the handle axially outward and rotating it 180 degrees.



Fig. 12. Suspension Drivers Seat Adjustment Controls

1. Backward/Forward Lever
2. Preload Adjustment Lever

SEAT BELT

The seat belt is for the operator's safety and should be worn at all times while operating the machine. Before fastening the seat belt, the operator's seat should be adjusted to the desired driving position. Seat belts must be worn across the pelvic region (hip bone) and adjusted snugly. Never adjust a seat belt across the abdomen.

Keep belts flat to avoid twisting and roping when not being used. Do not place heavy or sharp objects on the belts. To buckle, insert the tongue portion of the buckle into the locking position. To release, lift the top lever plate on the locking portion of the buckle and pull the tongue plate out.

HITCH CONTROLS (IF EQUIPPED)

HYDRAULIC CONTROLS (Fig. 13)

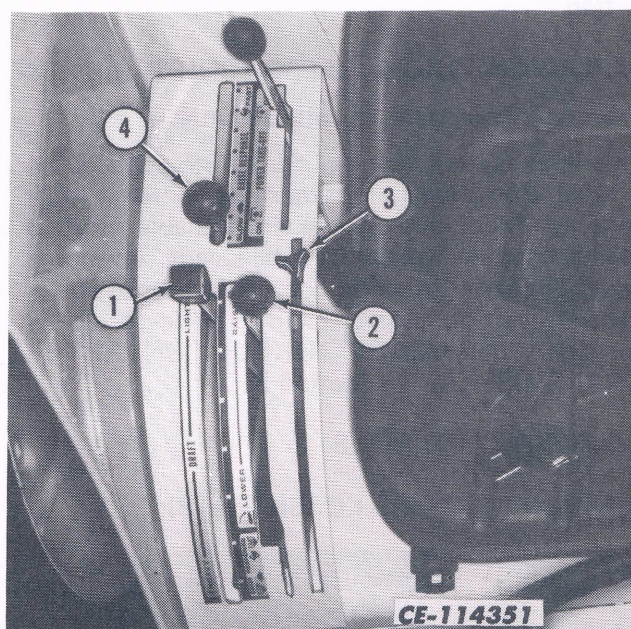


Fig. 13. Hydraulic Controls

1. Draft Control Lever
2. Position Control Lever
3. Adjustable Stop Knob
4. Raise Response Lever

Draft Control Lever (1)

This lever controls the ability of the hitch to quickly respond to variation in load. Refer to

"OPERATING THE THREE POINT HITCH" in Section 5.

Position Control Lever (2)

This lever is used to raise or lower all hitch mounted equipment between the working position and the transport position. Refer to "OPERATING THE THREE POINT HITCH" in Section 5.

Adjustable Stop (3)

This stop is used when returning the position control lever from the transport position to the previous operating position. Refer to "OPERATING THE THREE POINT HITCH" in Section 5.

Raise Response Lever (4)

This lever provides an adjustment to the speed that the hitch will raise. Refer to "OPERATING THE THREE POINT HITCH" in Section 5.

HITCH CONTROLS (Fig. 14)

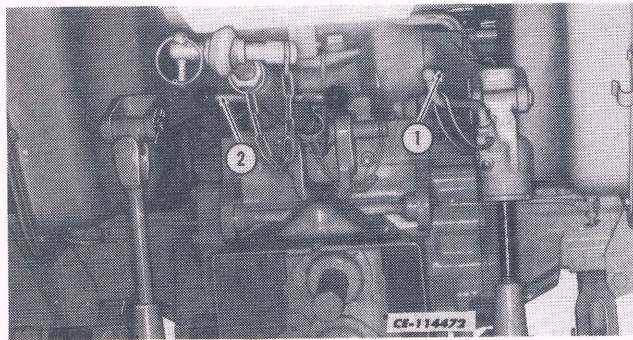


Fig. 14. Hitch Controls

1. Leveling Crank
2. Adjusting Handle

Leveling Crank (1)

The leveling crank is used to obtain the desired position of the hitch sockets relative to each other. Refer to "OPERATING THE THREE POINT HITCH" in Section 5.

Adjusting Handle (B)

The adjusting handle is used to shorten or lengthen the hitch upper link. The length of the link can be adjusted from 584 mm (23 in.) to 744 mm (30.5 in.). Refer to "OPERATING THE THREE POINT HITCH" in Section 5.

INDEPENDENT POWER TAKE OFF CONTROL LEVER (IF EQUIPPED) (NOT USED WITH TORQUE CONVERTER TRANSMISSION) (FIG. 15)

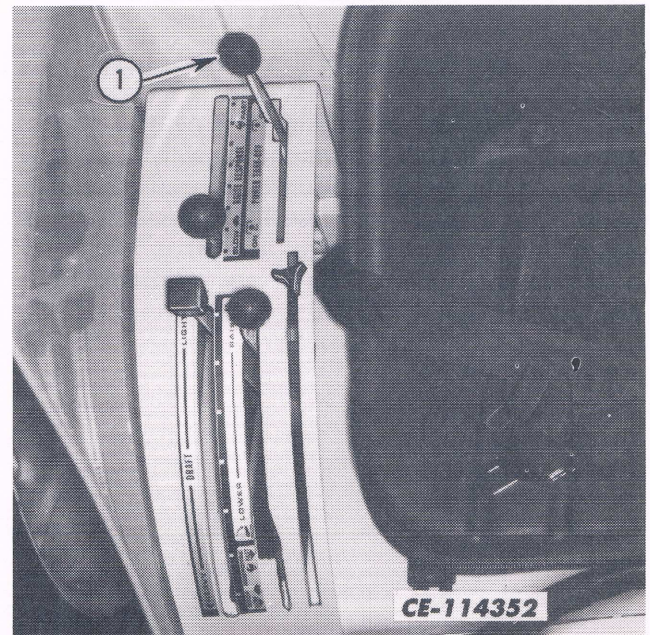


Fig. 15. Independent Power Take Off Control Lever

This lever is used to engage or disengage the independent power take off. Refer to "OPERATING THE INDEPENDENT POWER TAKE OFF" in Section 5.

AUXILIARY VALVE CONTROL LEVER (IF EQUIPPED) (FIG. 16)

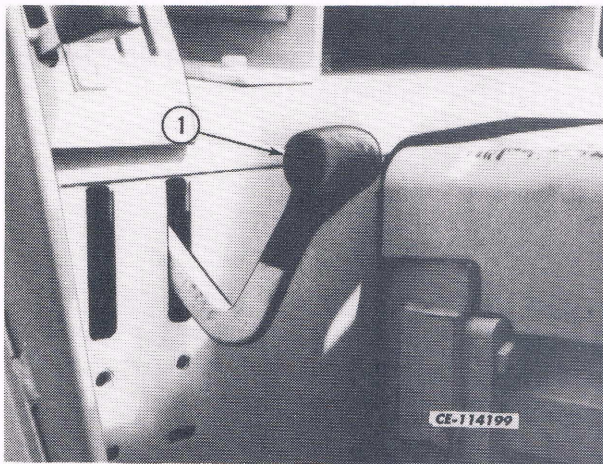


Fig. 16. Auxiliary Valve Control Lever

This lever has four positions; raise neutral, lower and float. It controls an auxiliary valve that supplies hydraulic fluid to mounted or trailing equipment. The machine can also be equipped with a second auxiliary and control lever that functions in the same manner. Refer to "OPERATING THE AUXILIARY VALVES" in Section 5.

1. COOLING SYSTEM

Check the coolant level in the radiator before starting the engine. If coolant level is low, add clean coolant. Refer to "COOLING SYSTEM" in Section 8.

2. ENGINE OIL LEVEL

Check the engine oil level. Maintain the engine oil level as near to the high level mark as possible. Add oil if level is low. Refer to "LUBRICANT SPECIFICATIONS AND CAPACITIES" in Section 7.

3. FUEL FILTERS

Drain off water and sediment. Refer to "FUEL SYSTEM" in Section 8.

4. FUEL TANK

Be sure the fuel tank is full. Fill the tank at the end of each day's operation to reduce condensation and moisture.

5. HYDRAULIC FLUID LEVEL

Check the level while the oil is cold. Refer to "HYDRAULIC SYSTEM" in Section 8.

6. SCHEDULED LUBRICATION

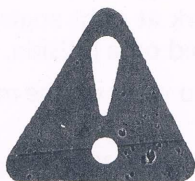
Perform all 10 hour lubrications. Refer to "LUBRICATION GUIDE" in Section 7.

7. GENERAL

Make a general inspection of the machine. Check for and correct any leaks in the hydraulic system and cooling system. Check for proper operation of head lights, tail lights and stop lights. Replace any burned out bulbs. Clean all instruments.

Check for cuts and tread wear on tires. Remove imbedded stones. Repair or replace tires as necessary.

WORK SAFELY — FOLLOW THESE RULES



This symbol is used to call your attention to instructions concerning your personal safety. Be sure to observe and follow these instructions, and be certain anyone operating this machine is aware of these safety rules. Also refer to the safety manual furnished with the machine. Additional copies can be obtained from your International Harvester Dealer. Order part number 1 212 796 C1.

**A CAREFUL OPERATOR IS THE BEST
INSURANCE AGAINST AN ACCIDENT.**

CAUTIONS

Before starting or operating this machine, read the following general precautions. These are listed here to help you protect the machine and to remind you of protection for yourself and those around you. Sound judgment and observance of these rules will help make your job a safer one.

Never pour cold coolant into the radiator if the engine is very hot unless conditions make it absolutely necessary. Under such conditions, start the engine and let it idle while slowly pouring the coolant into the radiator.

Do not place the machine under load without the proper engine oil pressure and operating temperature. After starting the engine, allow it to run at low idle for 5 to 10 minutes for thorough distribution of the lubricating oil.

Before shutting down, operate the engine at half throttle (no load) for three to five minutes. This will aid in cooling the engine and prevent after-boil.

Never shift the transmission into neutral (N) while the machine is moving under load downhill. The machine may go out of control or the transmission or engine may be damaged when the transmission is again placed in gear.

Perform a visual and operational check of the tractor before putting it to work.

The roll-over protective structure (R.O.P.S.) provides operator protection in the event of machine roll-over or upset. These structures are designed to bend during a roll-over to protect the operator from sudden impact loads. **DO NOT** attempt to repair a protective structure for further service after an accident. Repaired structures do not provide the original strength and protection. Contact your distributor for information on structure replacement.



CAUTION! For personal protection, observe the following safety precautions.

Carefully supervise operators. Be sure he is aware of safety and operating information in this manual.

Always carry a "charged" fire extinguisher and a first aid kit.

Use warning devices (i.e. flags, S.M.V. emblem, lights, etc.) which are approved for use by your local government agencies, when moving equipment on public roads. Keep these devices clean and in good working condition.

Avoid loose-fitting clothing, which could catch on moving parts.

Put all controls in stop position before starting the engine.

Before starting the engine or beginning to move the machine, give a couple of short blasts of the horn. Be sure the area is clear of personnel.

Never start the machine in an enclosed building unless the doors and windows are open.

Be sure muffler and exhaust pipe extensions are in place so exhaust gases are discharged away from the operator.

Do not permit anyone except the operator on the machine. Never haul passengers.

Fasten the seat belt before driving the machine.

Hydraulic fluid escaping under pressure can have enough force to penetrate the skin. Hydraulic fluid may also infect a minor cut or opening in the skin. *If injured by escaping fluid, see a doctor at once.* Serious infection or reaction can result if medical treatment is not given immediately.

Make sure all connections are tight and that hoses and lines are in good condition before applying pressure to the system. Relieve all pressure before

OPERATING THE MACHINE

disconnecting the lines or performing other work on the hydraulic system. To find a leak under pressure use a small piece of cardboard or wood. Never use hands.

Do not attempt to repair or tighten hoses when under pressure, or when the boom is raised, or with the engine running.

Look in the intended direction of travel to be sure personnel and allied equipment do not interfere with the loader work pattern.

Be sure the brakes are in good working order. Apply the brakes carefully on slippery roads.

Use extreme care when working close to fences, ditches, or on hillsides.

Reduce speed when traveling on rough roads.

Slow down when traveling in congested areas.

Avoid operating sideways on a steep slope.

Check overhead clearance carefully before driving under power lines, guy wires, bridges, low hanging tree branches, entering or leaving buildings, etc.

Always operate loader at speeds slow enough to insure complete operator control.

Do not transport a load with the bucket raised above transport position. Transport position is with the loader bucket in full roll back with boom raised to give same ground clearance as provided by the machine while still carrying the bucket low enough for proper visibility.

Avoid sharp turns when backing up with the bucket filled and raised.

Never use the loader as a battering ram.

Avoid sudden starts, excessive speed, and sudden stops when operating on hillside, rough ground, and most off-the-road operations.

Do not transport anyone on the loader bucket.

Give the right-of-way to loaded machines.

When using PTO equipment be sure all power line shielding is properly installed and in good working order.

Do not try to get on or off the machine while it is moving.

Never leave the machine unattended with the engine running or with the bucket in the raised position. Rest the bucket or buckets on a board, shut off the engine, apply the parking brake and remove the ignition key before leaving the machine.

Do not shut engine off in drive position.

Block the wheels securely, lower the loader bucket to the ground and park at right angle to the slope if the machine is parked on a hillside.

Never allow anyone to work on the machine while it is moving.

Avoid smoking when refueling or servicing the machine.

If it is necessary to make any checks with the engine running, use two men. One man must remain in the operator's compartment to safeguard the second man making checks or adjustments. As an added precaution, when making checks with the engine running, position the transmission in neutral (N). Apply the parking brake.

Always install adequate blocking to support the bucket before servicing any part of the machine which requires the bucket in the raised position. Never allow the hydraulic system to support the bucket when servicing the machine.

The hydraulic control levers, or other control levers, or other controls are not to be moved while the unit is being greased or worked on.

Never let anyone work under a raised bucket.

Disconnect the battery ground cable before working on the engine or electrical system.

To remove radiator cap when engine is "HOT", turn cap to the pressure relief point — let pressure and steam escape — then remove it.

Loosen the hydraulic reservoir filter cap gradually to relieve any pressure build-up when servicing the hydraulic reservoir.

Use a commercial solvent or kerosene unless otherwise specified for cleaning parts. Never operate the engine when using cleaning solvents.

Never operate the engine when cleaning or lubricating the machine.

Keep operating controls, pedals, hands and shoes free of grease, water and mud to insure positive control lever and pedal movement. The deck of the operator's compartment and all mounting steps must be kept free of oil, grease and mud to lessen the possibility of slipping.

Never leave the operator's compartment until the transmission range shift lever is placed in "N" (neutral) and the parking brake is applied.

STARTING THE ENGINE

NOTE: Before starting the engine be sure you understand the functions of all the control levers, pedals, switches and instrument panel gauges.

Step numbers correspond with the numbers shown in Figs. 1, 2, 3 and 4.



CAUTION! Before starting the engine clear the immediate area of personnel and obstructions.



CAUTION! Never start the engine in a building unless the doors and windows are open and ventilation is adequate.

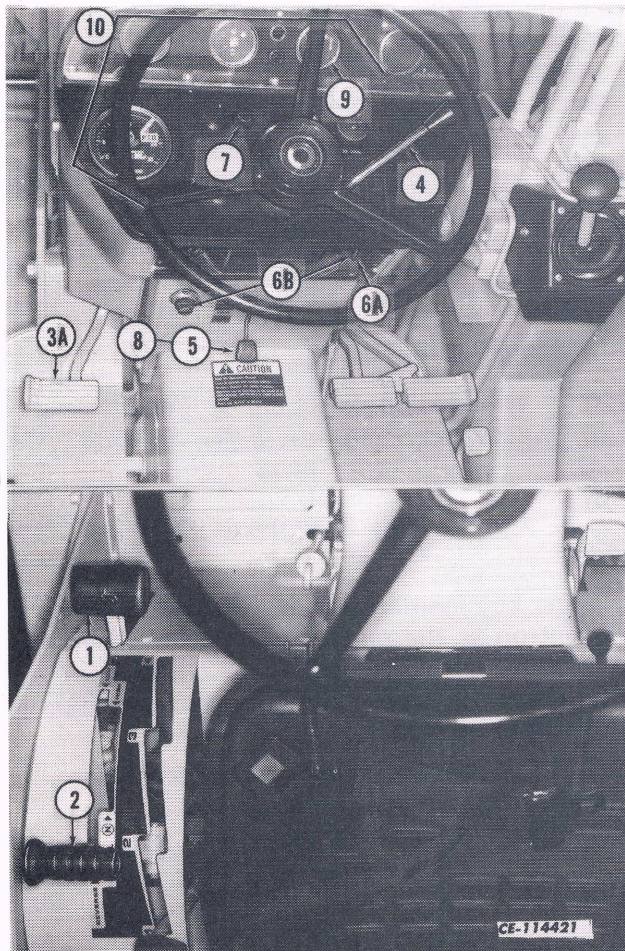


Fig. 1. Starting the Engine (Synchromesh Transmission)

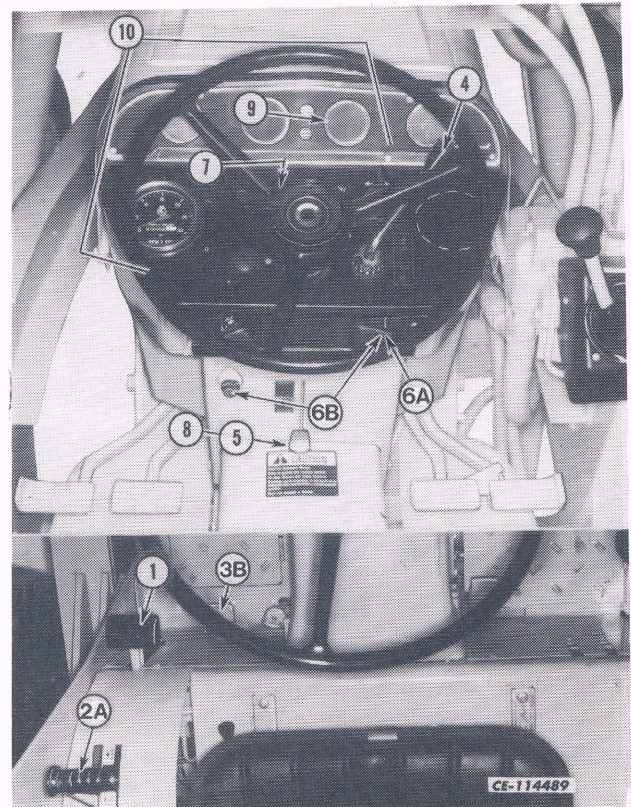


Fig. 2. Starting the Engine (Hydrostatic Drive with Foot Control)

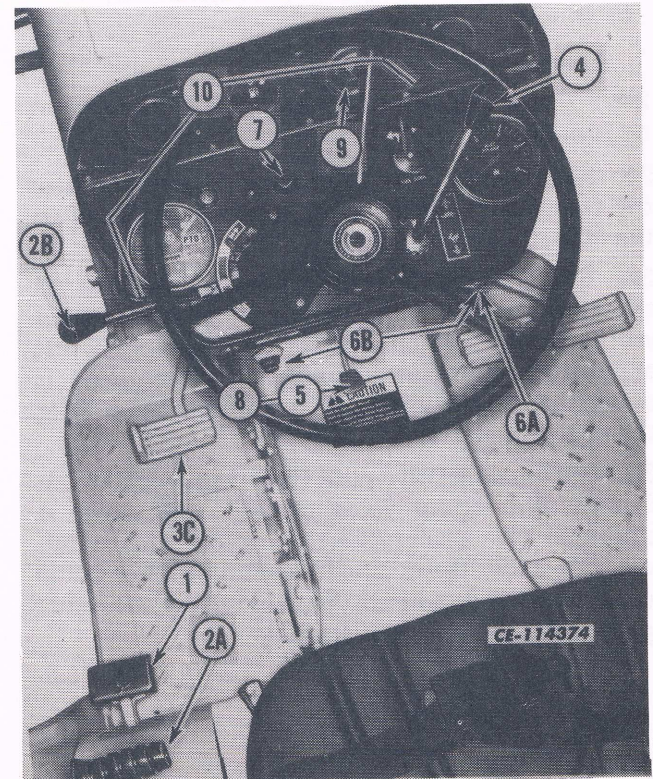


Fig. 3. Starting the Engine (Hydrostatic Drive with Hand Control)

OPERATING THE MACHINE

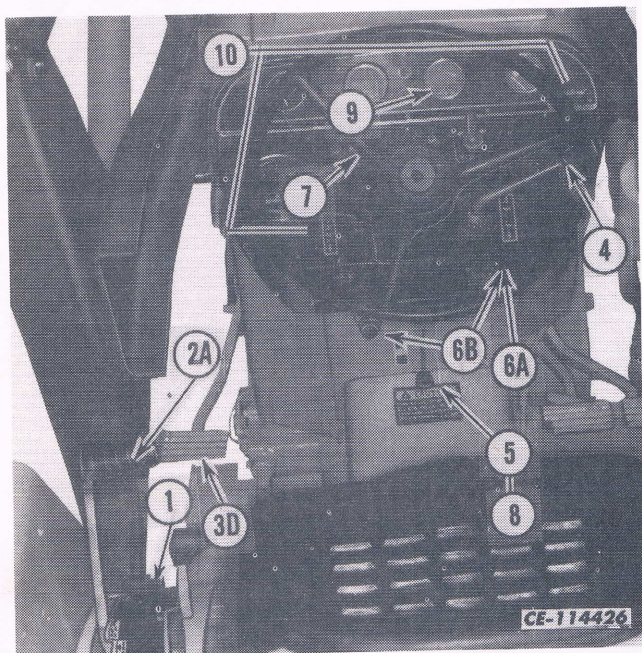


Fig. 4. Starting the Engine (Torque Converter Transmission)

NOTE: Make sure that the three fuel shut off valves at the bottom of the fuel tank are open.

NOTE: Do not attempt to start the engine by towing or pushing.

1. Apply the parking brake.

2A. Place the transmission range shift lever in neutral (N).

2B. **Hydrostatic Drive With Hand Control:** Place the transmission directional hand control lever to the N (neutral) position.

3A. **Synchromesh Transmission (Fig. 1):** Depress the clutch pedal. The clutch pedal is equipped with a safety starting switch. This switch will not allow the engine to start unless the clutch pedal is depressed. Slowly release the clutch pedal after the engine is started.

3B. **Hydrostatic Drive With Foot Controls (Fig. 2):** Depress the dump valve pedal. This pedal is equipped with a safety starting switch. This switch will not allow the engine to start unless the dump valve pedal is depressed. Slowly release the dump pedal after the engine is started.

3C. **Hydrostatic Drive With Hand Controls (Fig. 3):** Depress the dump valve pedal. This pedal is equipped with a safety starting switch. This switch will not allow the engine to start unless the dump valve pedal is depressed. Slowly release the dump pedal after the engine is started.

3D. **Torque Converter Transmission (Fig. 4):** Depress the clutch dump pedal. This pedal is equipped with a neutral starting switch. This switch will not allow the engine to start unless the clutch dump pedal is depressed. Slowly release the clutch dump pedal after the engine is started.

4. Position the engine speed control lever at approximately one half speed position.

5. Position the fuel shut off lever in the "START" position (approximately one third of the way up from the "STOP" position).

6. Crank the engine as follows:

6A. **Normal Start:** Turn the key ignition switch and release it the instant the engine starts.

NOTE: To avoid possible damage to the cranking motor, release the key ignition switch as soon as the engine starts. Never turn the key ignition switch while the engine is running.

6B. **Using Starting Aid:**

NOTE: The starting aid should be used only when the air temperature is below freezing (0°C).

NOTE: Do not spray ether directly into the air cleaner.

Turn the key ignition switch and press the ether start button at the same time. Hold the starting aid button for one second. If the temperature is below -18°C (0°F) additional applications of ether may be required.

NOTE: Additional injections of ether should be limited to two. Excessive use of ether could cause engine damage.

Release the key ignition switch the instant the engine starts. After the engine starts accelerating, reduce engine speed with the engine speed control lever, to the lowest no-load position that allows smooth sustained operation.

NOTE: *If the engine fails to start within 15 seconds, release the key ignition switch and allow a two (2) minute interval before again trying to start the engine. Continuous engine cranking without recovery period will damage the cranking motor and rapidly drain the batteries.*

If the engine will not start or runs roughly, it may be due to one of the following:

- a. Air may be in the fuel system. Refer to "FUEL SYSTEM" in Section 8.
- b. Air cleaner restricted. Refer to "AIR CLEANING SYSTEM" in Section 8.
- c. Ether injector is not functioning correctly. Refer to "ETHER INJECTOR" in Section 8.

7. After the engine starts the oil pressure warning light will come on. Let the engine run at low idle until the light goes off. The engine will then be at normal operating pressure.

NOTE: *Do not accelerate or hold the engine at full speed until oil pressure warning light goes off.*

8. Move the fuel shut off lever to "RUN" position.

9. Major changes in engine speed and/or loads should be avoided until the water temperature gauge reaches normal operating level.

10. Check all instruments for proper operation. Refer to the legend of Fig. 1, 2, 3 or 4 in Section 3 for proper indications on gauges.

11. (Not illustrated) Inspect the engine to see that it is running evenly and note whether the exhaust smoke shows evidence of poor combustion. Refer to "EXHAUST SMOKE TABLE" under "ENGINE" in Section 8.

DRIVING THE MACHINE (SYNCHROMESH TRANSMISSION)

Step numbers correspond with numbers shown in Fig. 5.



CAUTION! Before driving the machine adjust the seat belt and buckle yourself in.

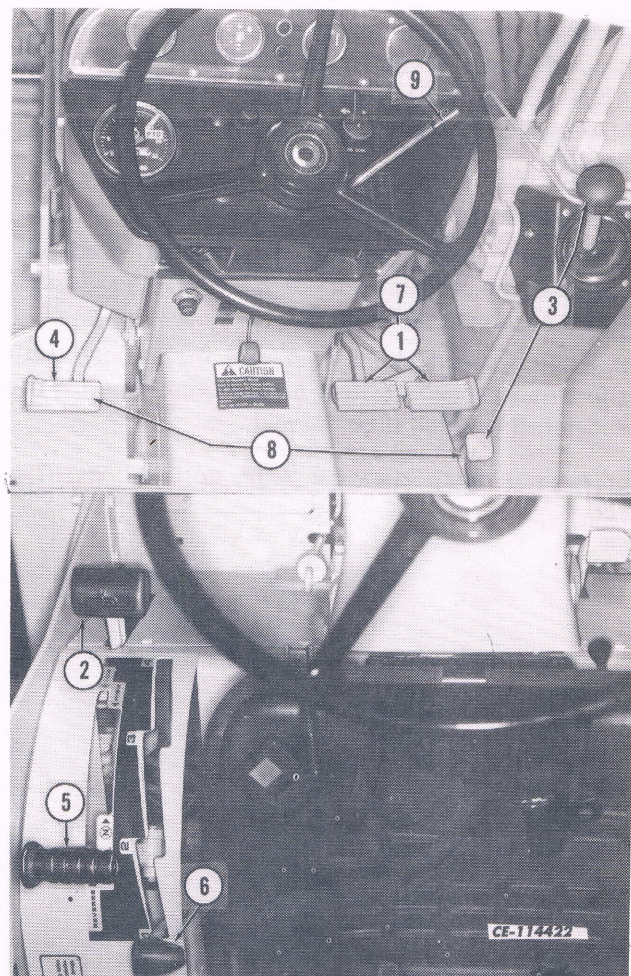


Fig. 5. Driving the Machine Equipped With Synchromesh Transmission

1. Depress the brake pedals.
2. Release the parking brake.
3. Depress the accelerator pedal slightly to increase engine speed and raise the loader bucket, or any other attachment off the ground before moving the machine. After the equipment is raised, release the accelerator pedal to reduce engine speed to idle.
4. Depress the clutch pedal.

NOTE: *The clutch pedal must be depressed before moving the transmission range shift lever or transmission, speed shift lever.*

5. Move the transmission range shift lever to the desired range. Refer to "SHIFTING THE RANGE AND SPEED LEVERS" under "DRIVING THE MACHINE (Synchromesh Transmission)" in this Section.

OPERATING THE MACHINE

6. Move the transmission speed shift lever in the desired speed. Refer to "SHIFTING THE RANGE AND SPEED LEVERS" under "DRIVING THE MACHINE (Synchronesh Transmission)" in this Section.

7. Release the brake pedals.

8. Slowly release the clutch pedal and gradually depress the accelerator pedal until the desired travel speed is reached.

9. Engine speed can be set and maintained with the engine speed control lever instead of with the accelerator pedal, if so desired.

SHIFTING THE RANGE AND SPEED LEVERS (Fig. 6)

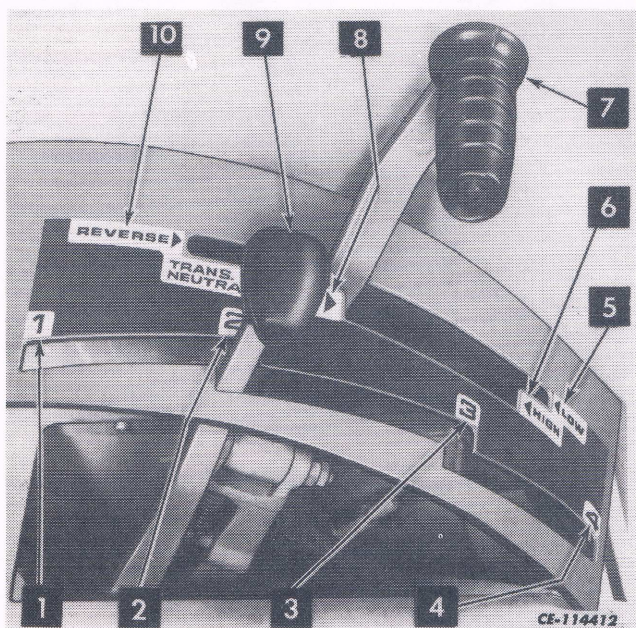


Fig. 6. Transmission Range and Speed Shift Levers

1. First Speed
2. Second Speed
3. Third Speed
4. Fourth Speed
5. Low Range
6. High Range
7. Range and Reverse Shift Lever
8. Neutral
9. Speed Shift Lever
10. Reverse

The transmission range and reverse lever (7) and transmission speed lever (9) are used to select any one of the eight forward or four reverse speeds. The range lever also has a neutral position (8).

Range And Reverse Shift Lever (7)

To operate the range and reverse lever, depress the clutch pedal and move the lever all the way forward to "HIGH" or "LOW" position for forward travel and all the way rearward for reverse travel. It is necessary to depress the clutch pedal before moving the range and reverse lever because of a mechanical interlock.

NOTE: *Never shift the range and reverse lever while the machine is moving.*

Speed Shift Lever (9)

With the clutch pedal depressed (disengaged) move the speed shift lever to the desired speed range. Refer to "TRANSMISSION" in Section 9 for ground speeds of the various speed ranges.

The speed transmission is equipped with synchronizers and therefore can be shifted with the machine in motion by disengaging the clutch and applying a steady and continuous pressure to the speed lever until the shift is complete.

Under normal conditions this action is instantaneous. Sometimes difficulty is experienced in shifting the speed lever when the machine is standing still. Under these conditions the same continuous pressure should be applied to the speed lever and at the same time the clutch should be engaged slightly.

This will give sufficient rotation to the synchronizer and allow the shift to be completed without difficulty.

DRIVING THE MACHINE (HYDROSTATIC TRANSMISSION WITH FOOT CONTROLS)

Step numbers correspond with the numbers shown on Fig. 7.



CAUTION! Before driving the machine adjust the seat belt and buckle yourself in.

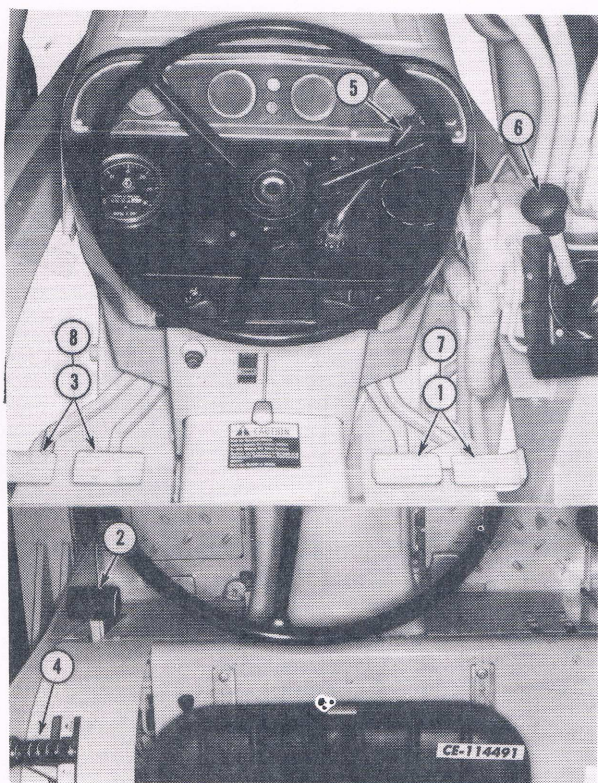


Fig. 7. Driving the Machine Equipped With Hydrostatic Transmission With Foot Controls

1. Depress the brake pedals.
2. Release the parking brake.
3. Make sure both the forward and reverse directional pedals are in neutral position (not depressed).

NOTE: *The forward and reverse directional pedals must be in neutral position or the dump pedal must be depressed before moving the range shift lever.*

4. Move the transmission range shift lever to the desired range. Refer to "RANGE LEVER" under "OPERATING THE HYDROSTATIC TRANSMISSION WITH FOOT CONTROLS" in this section.
5. Increase engine speed, depending on the operation to be performed.
6. Raise the loader bucket, or any other attachment off the ground before moving the machine.
7. Release the brake pedals.
8. Gradually depress either the forward or reverse directional pedal until the desired travel speed and/

or torque range is reached. Refer to "FORWARD/REVERSE FOOT PEDALS" under "OPERATING THE HYDROSTATIC TRANSMISSION WITH FOOT CONTROLS" in this section.

OPERATING THE HYDROSTATIC TRANSMISSION WITH FOOT CONTROLS

Forward/Reverse Foot Pedals

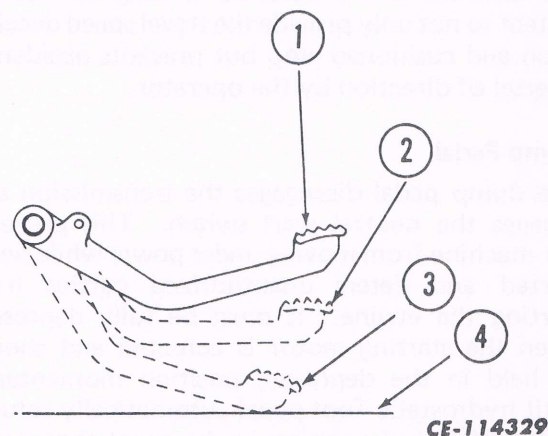


Fig. 8. Foot Pedal Positions

1. Hydrostatic Pedal in Neutral Position
2. Slow Travel Speed - Maximum Torque
3. Full Travel Speed - Minimum Torque
4. Platform

Best operation is always with gradual movement of hydrostatic pedals.

Greatest efficiency of entire machine and loader, is at 2000 engine RPM and up. The machine forward and reverse travel speeds are controlled by range movement of the foot pedals.

When pedal is not depressed, the transmission is in a locked or braked position.

Maximum torque and slowest travel speed is obtained with the least downward movement of the pedal. Refer to Fig. 8.

Example: The least possible depression of the pedals will give you the slowest travel speed with the greatest torque to the drive wheels for digging or crowding into the stock pile or bank.

Using the machine brakes is rarely required because:

OPERATING THE MACHINE

As your foot moves upward from the hydrostatic pedal you are automatically decelerating your travel speed . . . and when your foot moves completely off the pedal, the pedal returns to the neutral or lockup position and automatically brakes your transmission and travel.

The cushioned braking and travel speed deceleration is timed with the automatic pedal return (or full-up position).

This definite time differential is designed into the system to not only provide the travel speed deceleration and cushioned stop but prevents accidental reversal of direction by the operator.

Dump Pedal

The dump pedal disengages the transmission and engages the neutral start switch. This prevents the machine from moving under power while being started and deters unauthorized parties from starting the engine. It must be fully depressed when the starting motor is actuated and should be held in the depressed position momentarily until hydrostatic foot pedal automatically returns to the "full up" position in the event that it was in a depressed position and the engine had stalled. By holding the dump pedal in the depressed position momentarily after the engine is started, any movement of the machine will be prevented.

An operator accustomed to a mechanical or torque converter transmission equipped machine may be in the habit of reducing the engine speed for more positive control when operating in close quarters. This is neither necessary nor desirable with the hydrostatic machine because the higher engine RPM will provide more positive control of not only the hydraulic tools but also the travel speed and automatic deceleration and braking. Maximum performance and control is achieved with high engine speed.

Range Lever

"LOW" position provides the highest torque and has a travel speed range of 0 to 11.2 km/h (0 to 7 mph). When the machine is in a "work" operation such as mowing, cutting, etc., the transmission range lever should be in "LOW" position.

Use the "LOW" range when loading or unloading the machine onto or off of a trailer or truck. This provides maximum control for maneuvering and increased torque for moving up the incline.

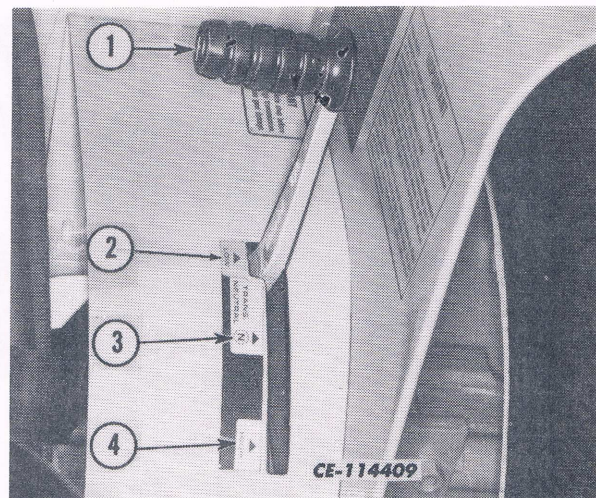


Fig. 9. Transmission Range Shift Lever and Positions

1. Range Shift Lever
2. Low Position
3. Neutral Position
4. High Position

"HIGH" position (4, Fig. 9) provides a travel speed range of 0 to 30.5 km/h (0 to 19 mph). In "HIGH" range, travel speed deceleration is less abrupt (slower) and the automatic braking action is more cushioned.

When the lever is in "N" (neutral) (3, Fig. 9) position the range transmission in the rear frame is disengaged and the machine will not move under power.

NOTE: *Never shift the range transmission shift lever when the machine is in motion.*

DRIVING THE MACHINE (HYDROSTATIC TRANSMISSION WITH HAND CONTROL)

Step numbers correspond with the numbers shown on Fig. 10.



CAUTION! Before driving the machine adjust the seat belt and buckle yourself in.

1. Depress the brake pedals.
2. Release the parking brake.

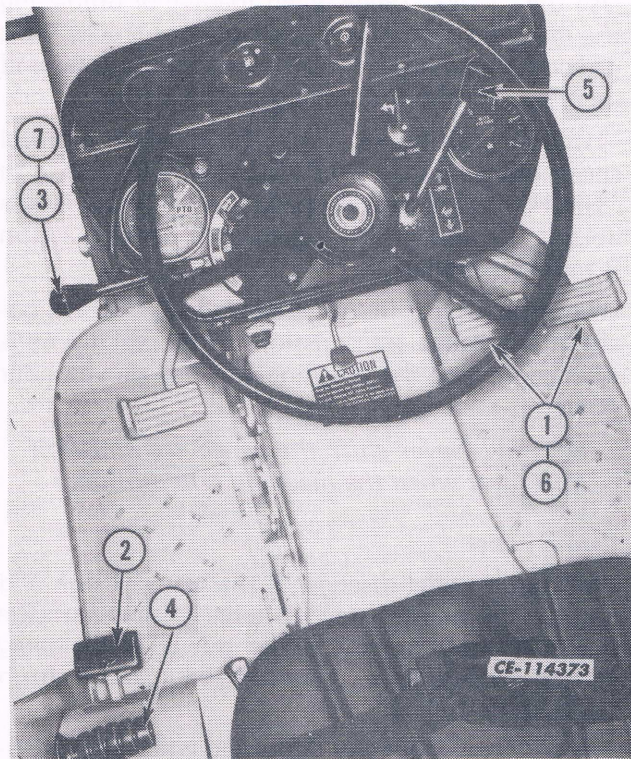


Fig. 10. Driving the Machine Equipped With Hydrostatic Transmission With Hand Control

3. Make sure the transmission directional hand control is in "N" (neutral) position.

NOTE: *The transmission directional hand control must be in neutral or the dump pedal must be depressed before moving the range shift lever.*

4. Move the transmission range shift lever to the desired range. Refer to "RANGE LEVER" under "OPERATING THE HYDROSTATIC HAND CONTROLLED TRANSMISSION" in this section.

5. Increase engine speed to 2000 rpm or higher, depending on the operation to be performed.

NOTE: *Raise any mounted equipment off the ground before moving the machine.*

6. Release the brake pedals.

7. Gradually move the transmission directional hand control to either the forward or reverse direction until the desired travel speed and/or torque range is reached. Refer to "FORWARD/REVERSE DIRECTIONAL CONTROL LEVER" under "OPERATING THE HYDROSTATIC HAND CONTROLLED TRANSMISSION" in this section.

OPERATING THE HYDROSTATIC HAND CONTROLLED TRANSMISSION

Forward/Reverse Directional Control Lever (Fig. 11)

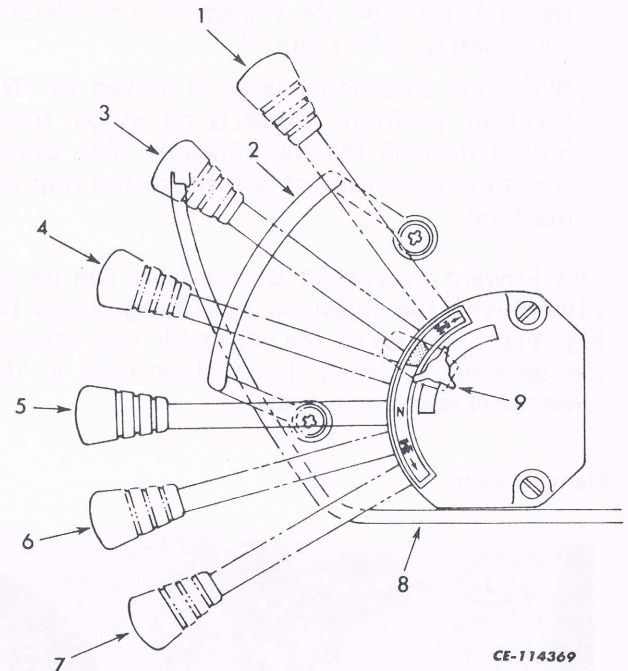


Fig. 11. Hand Control Directional Lever

1. Full Forward Travel Speed-Minimum Torque
2. Steady Rest Rod
3. Normal Operating Speed
4. Slow Forward Travel Speed-Maximum Torque
5. Neutral Position
6. Slow Reverse Travel Speed-Maximum Torque
7. Full Reverse Travel Speed-Minimum Torque
8. Dash Panel
9. Adjustable Stop

Best operation is always with gradual movement of the forward/reverse directional lever.

Greatest efficiency of the machine is at 2000 RPM and up, depending on desired speed of tools. The machine forward and reverse travel speeds are controlled by the range movement of the directional lever.

When the lever is in the neutral position (5), the transmission is in the locked or braked position.

OPERATING THE MACHINE

Maximum torque and slowest travel speed is obtained with the least forward(4) or rearward (6) movement of the directional lever.

Using the machine brakes is rarely required because:

As the directional lever is moved toward "N" (neutral) position the transmission decelerates and travel speed is reduced.

When the directional lever is moved to "N" (neutral) position, power is no longer transmitted through the transmission. This causes the transmission to act as a brake and stop the machine.

The forward movement of the lever can be restricted with the adjustable stop Range Lever (9, Fig. 11). The use of the adjustable stop enables the operator to bring the machine back to the same travel speed repeatedly.

Range Lever

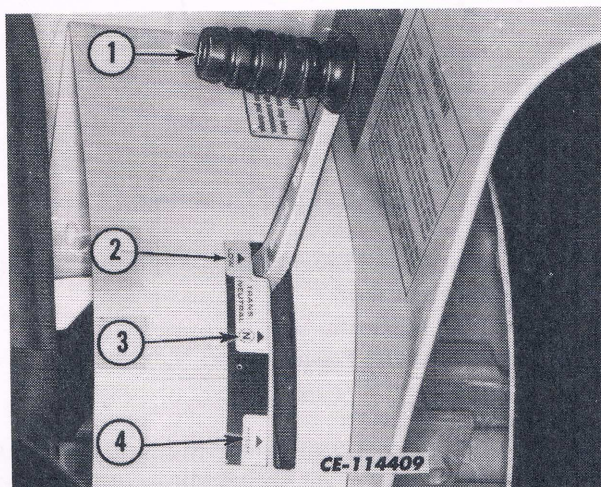


Fig. 12. Transmission Range Shift Lever and Positions

1. Range Shift Lever
2. Low Position
3. Neutral Position
4. High Position

"LOW" position (2, Fig. 12) provides the highest torque and has a travel speed range of 0 to 11.2 km/h (0 to 7 mph). When the machine is in a "work" operation such as mowing, cutting, etc., the transmission range lever should be in "LOW" position.

Use the "LOW" range when loading or unloading the machine onto or off of a trailer or truck. This provides maximum control for maneuvering and increased torque for moving up the incline.

"HIGH" position (4, Fig. 12) provides a travel speed range of 0 to 30.5 km/h (0 to 19 mph). In "HIGH" range, travel speed deceleration is less abrupt (slower) and the automatic braking action is more cushioned.

When the lever is in "N" (neutral) (3, Fig. 12) position the range transmission in the rear frame is disengaged and the machine will not move under power.

NOTE: *Never shift the range transmission shift lever when the machine is in motion.*

Dump Pedal

The dump pedal disengages the transmission and engages the neutral start switch. This prevents the machine from moving under power while being started and deters unauthorized parties from starting the engine.

The pedal must be fully depressed when the cranking motor is actuated. By holding the dump pedal in the depressed position momentarily after the engine is started, any movement of the machine will be prevented.

An operator accustomed to a mechanical or torque converter transmission equipped machine may be in the habit of reducing the engine speed for more positive control when operating in close quarters. This is neither necessary nor desirable with the hydrostatic machine because the higher engine RPM will provide more positive control of not only the hydraulic tools but also the travel speed and automatic deceleration and braking. Maximum performance and control is achieved with high engine speed.

DRIVING THE MACHINE (TORQUE CONVERTER TRANSMISSION)

Step numbers correspond with numbers shown in Fig. 13.



CAUTION! Before driving the machine adjust the seat belt and buckle yourself in.

1. Depress the brake pedals.
2. Release the parking brake.

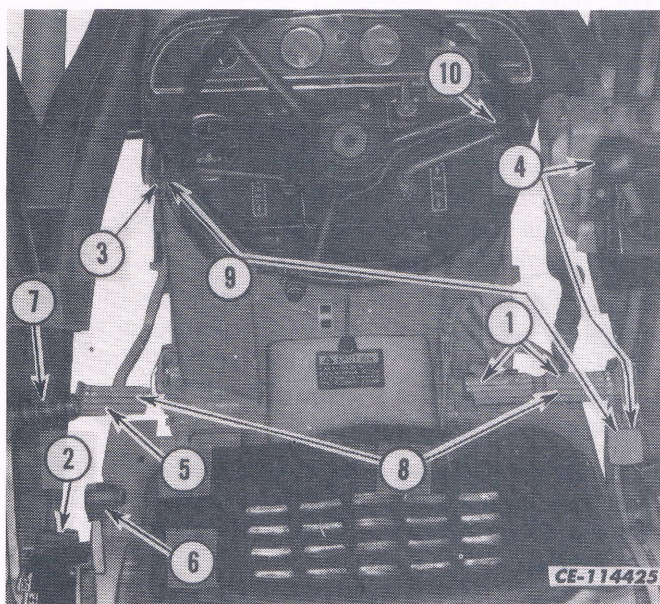


Fig. 13. Driving the Machine Equipped With Torque Converter Transmission

3. Make sure the transmission forward/reverse lever is in neutral position.

NOTE: *The forward/reverse lever must be in neutral or the torque converter dump pedal must be depressed before moving the range shift lever.*

4. Depress the accelerator pedal slightly to increase engine speed and raise the loader bucket or any other attachment off the ground before moving the machine. After the equipment is raised, release the accelerator pedal to reduce engine speed to idle.

5. Depress the torque converter dump pedal. Refer to "TORQUE CONVERTER DUMP PEDAL" under "DRIVING THE MACHINE (Torque Converter Transmission)" in this section.

6. Move the transmission speed shift lever to the desired speed. Refer to "SHIFTING THE RANGE, SPEED AND FORWARD/REVERSE CONTROL LEVERS" under "DRIVING THE MACHINE (Torque Converter Transmission)" in this section.

7. Move the transmission range shift lever to the desired range. Refer to "SHIFTING THE RANGE, SPEED AND FORWARD/REVERSE CONTROL LEVERS" in this section.

8. Release the brake pedals and torque converter dump pedal.

9. Move the forward/reverse control lever to the desired direction and depress the accelerator grad-

ually until the desired travel speed is reached. Refer to "SHIFTING THE RANGE, SPEED AND FORWARD/REVERSE CONTROL LEVERS" in this section.

10. Engine speed can be set and maintained with the engine speed control lever instead of with the accelerator pedal, if so desired.

SHIFTING THE RANGE, SPEED AND FORWARD/REVERSE CONTROL LEVERS

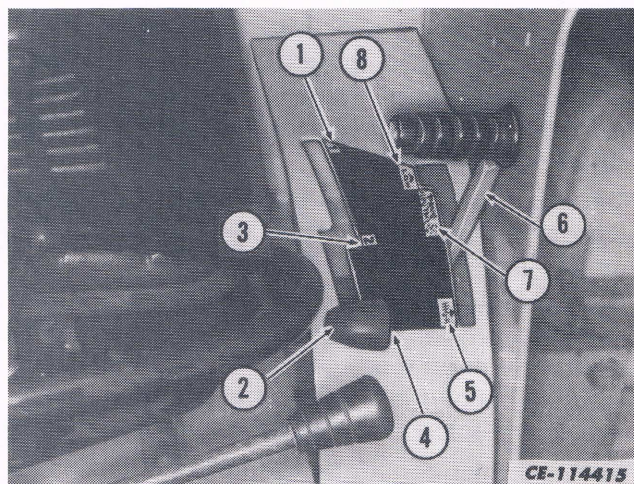


Fig. 14. Transmission Range and Speed Shift Levers

1. First Speed
2. Transmission Speed Shift Lever
3. Second Speed
4. Third Speed
5. High Range
6. Transmission Range Shift Lever
7. "N" (neutral)
8. Low Range

The transmission range lever (6, Fig. 14) and speed lever (2) are used to select any one of the six forward or three reverse speeds. The range lever also has a "N" (neutral) position (7).

Range Shift Lever (6, Fig. 14)

To operate the range lever, depress the torque converter dump pedal and move the lever all the way forward for "HIGH" range or all the way rearward for "LOW" range or to the center position for "N" neutral. When the range lever is in "N" (neutral) no power can be transmitted to the drive wheels.

OPERATING THE MACHINE

The range lever can also be shifted, without depressing the dump pedal, if the forward/reverse control lever is in neutral position.

NOTE: *Never shift the range lever while the machine is moving.*

The range lever must be in "LOW" position to travel in reverse direction.

Speed Shift Lever (2, Fig. 14)

To operate the speed shift lever, depress the torque converter dump pedal and move the lever to the desired speed range. Refer to "TRANSMISSION" in Section 9 for ground speeds of the various speed ranges.

The speed shift lever can also be shifted, without depressing the dump pedal, if the forward/reverse control lever is in neutral position.

The transmission is equipped with synchronizers and therefore can be shifted with the machine in motion by depressing the torque converter dump pedal and applying a steady and continuous pressure to the speed lever until the shift is complete.

Under normal conditions this action is instantaneous. Sometimes difficulty is experienced in shifting the speed lever when the machine is standing still. Under these conditions the same continuous pressure should be applied to the speed lever and at the same time the dump pedal should be let up slightly.

This will give sufficient rotation to the synchronizer and allow the shift to be completed without difficulty.

Forward/Reverse Control Lever

The full power-shift feature of the torque converter transmission allows the machine to be shifted from one direction to the other without braking, stopping or reducing engine speed. The modulation control valve regulates the shift so it is smooth.

The forward/reverse control lever operates the forward/reverse spool of the dump and modulation control valve and engages the high range lockout.

The forward/reverse spool regulates the flow of hydraulic fluid to the forward or reverse side of the clutch pack in the transmission.

The high range lockout prevents the forward/reverse lever from being moved into reverse position when the transmission range lever is in "HIGH" range.

NOTE: *The forward/reverse lever should always be put in "N" (neutral) position and locked in place with the neutral lock lever anytime the machine is parked, whether the engine is running or not.*

Move the lever all the way forward for forward travel or all the way rearward for reverse travel. Move the lever to the center or "N" (neutral) position to stop the transmission of power to the wheels.

The forward/reverse lever is equipped with a neutral lock lever. Use this lock to prevent movement of the forward/reverse lever while operating the backhoe.

Converter Overheating

If the torque converter oil temperature gauge pointer moves into the red (HOT) range during machine operation, stop the machine immediately. Shift the transmission to neutral and run the engine at 1000 to 1200 rpm. The temperature should drop to the proper operating level within a few minutes. If the pointer remains in the red area, stop the engine and determine the cause of the problem.

Generally when overheating does occur, it is due to operating in too high a speed gear range, causing a buildup of heat in the torque converter. Down-shift and operate in the next lower gear range. The temperature should stabilize. If not, down-shift again if possible.

TORQUE CONVERTER DUMP PEDAL

The torque converter dump pedal performs three functions:

1. It actuates the neutral start switch when fully depressed and enables the engine to be started with the transmission in a neutral condition.
2. When in the up position the transmission hydraulic fluid power circuit is complete, if the range lever and forward/reverse lever are engaged.

When the pedal is partially depressed, the hydraulic circuit is interrupted and the transmission

becomes neutralized allowing speed and range shifts to be made. (See NOTE below).

3. When fully depressed it actuates the brakes and neutralizes the transmission to hold the tractor stationary while operating the loader. This makes all engine power available to the hydraulics. Depress the dump pedal or move the forward/reverse lever to "N" (neutral) before shifting the speed shift lever or range lever.

NOTE: *A speed shift can be made when the machine is moving. The machine must be completely stopped when making a range shift.*

STEERING THE MACHINE

The machine is steered in the conventional manner by means of the steering wheel; however, to make a sharp or pivot turn, press the right or left brake pedal, depending on the direction in which the turn is to be made. The machine is equipped with the hydrostatic-type power steering.

Reduce speed before making turns or when applying the brakes. The danger of any driven machine overturning increases four times when the speed is doubled. (Refer to "TURNING THE MACHINE WITH BRAKE ASSIST.")

TURNING THE MACHINE WITH BRAKE ASSIST

Before attempting sharp or pivot turns, unlatch the brake pedals to allow individual operation of the pedals. To execute a sharp or pivot turn, rotate the steering wheel and simultaneously apply the brake corresponding to the direction turning.



CAUTION! Do not attempt sharp or pivot turns on incline, at fast speeds or when using the loader bucket.

OPERATING THE DIFFERENTIAL LOCK

The pedal is operated by heel pressure to engage and hold in engagement the differential lock. The dowel pin-type coupling, locks the planetary drive shafts together so the rear wheels cannot turn at different speeds. This prevents one wheel from spinning out and stalling the tractor when wet spots or slippery surface conditions are encountered.

The differential lock is also useful in preventing unequal drive wheel slip when one wheel is operating under poorer traction conditions than the other. Continual engagement of the differential lock is not harmful to the wearing parts and may result in improved performance of the tractor and draft control system even when excessively unequal slip is not apparent. However, the differential lock must be disengaged before attempting turns.

The pedal may be depressed to engage the differential lock under wheel slip or when the tractor is still in motion. A spring-loaded safety device has been incorporated to prevent too-forceful engagement. If one wheel is spinning too rapidly for the differential back to engage, a clicking noise will be heard. If this continues for more than a few seconds, depress the engine clutch pedal (Synchromesh Transmission) or dump valve pedal (Hydrostatic and Torque Converter Transmissions) momentarily and the differential lock will come into operation immediately.

If the differential lock does not disengage when the foot is taken off the pedal, as evidenced by the pedal remaining in the depressed position, a quick pressure on one of the brake pedals, or a momentary depression of the clutch pedal (Synchromesh Transmission) or dump valve pedal (Hydrostatic and Torque Converter Transmissions) will relieve the torque through the clutch collar so that a spring on the lock control shaft can move the collar out of engagement. The pedal will remain in the depressed position until the differential lock has been disengaged.

COLD WEATHER HYDRAULIC FLUID WARM-UP

Warm hydraulic fluid by running tractor engine at approximately 1000 rpm, pushing a valve lever and holding it to make the system operate on high pressure, permitting the hydraulic fluid to by-pass through the relief valve until the return line becomes warm.

OPERATING THE LOADER

The single loader control lever is operated with the right hand and permits the operator to raise or lower the boom and roll-back or dump the bucket while operating the machine with the left hand.

OPERATING THE MACHINE

The loader is equipped with a bucket level indicator. Refer to "BUCKET LEVEL INDICATOR" in Section 3.

The hydraulic self-leveling feature maintains proper bucket roll-back angle as the boom is raised.

LOADER CONTROL LEVER (Fig. 15)

The loader control lever has six positions. BOOM RAISE, HOLD, BUCKET ROLL BACK, BUCKET DUMP, BOOM LOWER and FLOAT.



CAUTION! The boom assembly, if raised, can be lowered any time the lever is moved to float or lower position whether the engine is running or not. Always lower the boom to the ground when it is not in use.

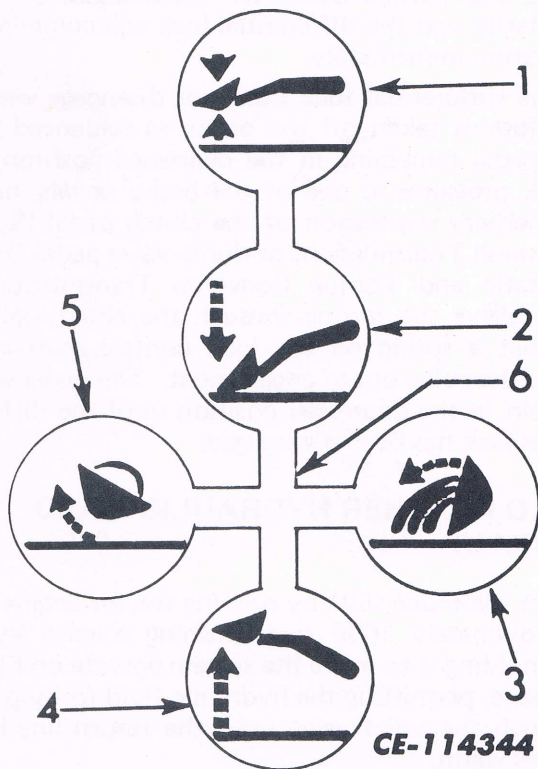


Fig. 15. Loader Control Positions

1. Float Position
2. Boom Lower
3. Bucket Dump
4. Boom Raise
5. Bucket Roll-Back
6. Hold Position

Boom Raise (4, Fig. 15)

To raise the boom, pull the lever back. The lever will return to HOLD when released.

Hold (6, Fig. 15)

The control lever, when not in the detented float position, will automatically return to HOLD when released. The loader boom will remain stationary in the position that it is in when the lever is placed in HOLD.

Bucket Roll Back (5, Fig. 15)

To roll the bucket back, move the lever to the left. The lever will return to HOLD when released.

Bucket Dump (3, Fig. 15)

To dump the bucket, move the lever to the right. The lever will return to HOLD when released.

Boom Lower (2, Fig. 15)

Push the lever part way forward to lower the boom. The lever will automatically return to HOLD when released.

Float (1, Fig. 15)

Push the lever all the way forward for FLOAT position. This position is detented so the lever must be moved manually out of the position. No hydraulic pressure is applied to the boom cylinders while in FLOAT. Use FLOAT position to follow the contour of the ground when leveling or to lower the loader boom by gravity.

NOTE: When cylinders reach the fully extended or retracted position, release the control lever to the HOLD (neutral) position to keep excessive amounts of fluid from bypassing through the relief valve and overheating the hydraulic fluid.

The speed with which the boom or bucket moves depends upon the movement of the loader control lever. Moving the lever completely into a position will cause the fastest movement of the boom or bucket. A partial movement (feathering) of the control will slow the action.

NOTE: When it is necessary to lift a heavy load to a high position and then lower it to another position before dumping, be sure to operate the control valve very carefully. Do not suddenly thrust the valve wide open and then jerk it completely closed. The heavy

load will gain momentum downward when the control valve is released; then when the valve is suddenly closed, the loader's mechanical travel is halted, but the momentum of the heavy load continues, resulting in dangerous bouncing of the load on the booms. Overcome this by slowly cracking or opening the control valve; this will release the fluid gradually and by doing so will ease the load down to the lower position desired, instead of dropping and bouncing it.

Diagonal movements of the lever with the right hand permit the operator to raise the boom and close the bucket, or lower the boom and level the bucket, at the same time, while operating the tractor with the left hand.

SELF LEVELING ADJUSTMENT (Fig. 16)

The bucket self leveler will prevent the material in the bucket from spilling over the bucket back. It does this by keeping the bucket position constant while the boom is being raised. The bucket can be rolled back at any time during the raise cycle by operating the bucket control lever, thus overriding the self-leveling unit.



CAUTION! When you use the bucket valve control lever to override the hydraulic self leveling it can cause material to be spilled over the bucket back on the machine.



CAUTION! Keep all people from under loader boom when in the raised position.

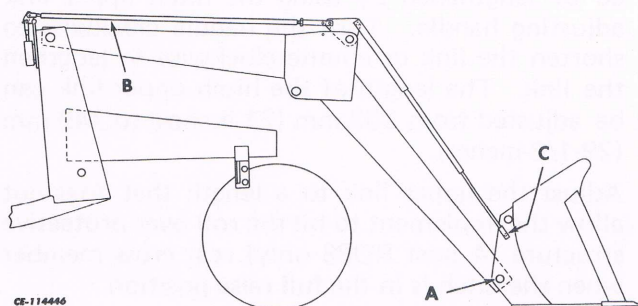


Fig. 16. Bucket Self Leveler Adjustment

The length nominal for rod "B" is 1473 mm (58") when rod attached to ball joint "C" is 858.5 mm (33.8") long. The length for rod "B" is 1463 mm (57.6") when the rod attached to ball joint "C" is 871 mm (34.3") long. Thread engagement be-

tween rod and ball joint "C" should be 19mm (3/4"). If bucket does not begin to self level between 1270 and 1778 mm (50 and 70") then adjust ball joint "C." More thread engagement makes self leveling start later, less thread engagement makes self leveling start sooner. Note minimum thread engagement is 9.5 mm (3/8"). If adjustment at ball joint "C" is not adequate, more adjustment is available at threaded clevis connected to rod "B." Lengthening rod "B" starts self leveling sooner. Shorten to start self leveling later. Note minimum thread engagement is 12.7 mm (1/2").

OPERATING THE THREE-POINT HITCH (IF EQUIPPED)

GENERAL

The three-point hitch with position control and draft control provides a fast and convenient means of attaching rear-mounted equipment conforming to A.S.A.E. and S.A.E. specifications. You can mount Category I International Harvester Company three-point equipment or most three-point equipment of other manufacturers.

The three-point hitch consists of two hitch lower links and a hitch upper link to connect the equipment to the machine. The left and right hitch lower links are pinned to clevis type lugs on the rear axle housing. They are suspended by lift links from a rockshaft which is part of the draft control unit.

The rear sections of the lower links can be extended by lifting the latches on the lower links, thus providing easier hitching.

The hitch upper link is attached to the machine by means of a bellcrank which is part of the draft control unit and is lengthened or shortened by means of the adjusting handle. A swinging drawbar can be attached quickly and easily when trailing-type equipment is used.

The three-point hitch is activated by a hydraulic draft control unit which is on top of the rear frame. This unit incorporates a rockshaft, lift cylinder, main control valve with linkage, raise response valve and drop response valve. Position control draft control and raise response control levers operate in a quadrant mounted on the right side of the seat. Draft control is obtained through a regulation of the load applied to the hitch upper link, which acts upon a torsion bar spring through a bellcrank mounted on the rear of the hydraulic lift housing.

OPERATING THE MACHINE

LIFT LINKS AND LEVELING CRANKS (8 and 9, Fig. 17)

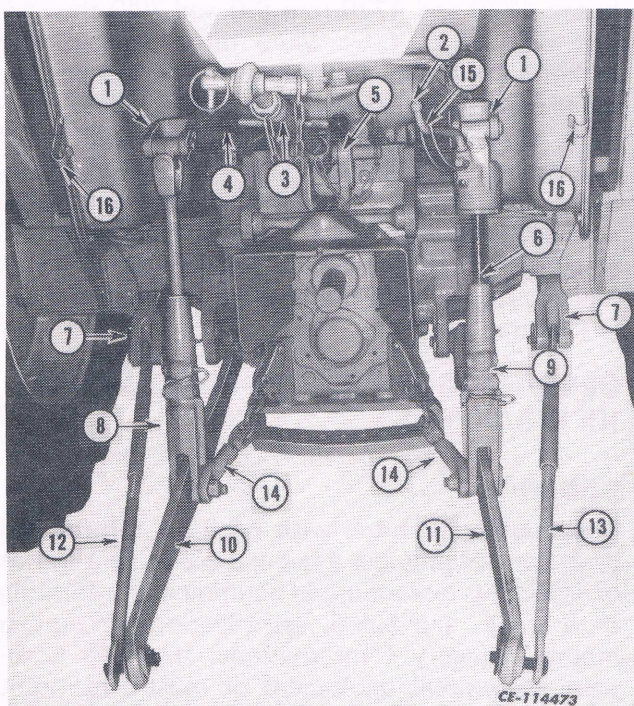


Fig. 17. Principal Parts of the Three-Point Hitch

1. Rockshaft Arms
2. Leveling Crank
3. Hitch Upper Link
4. Adjusting Handle
5. Upper Link Attaching Bracket
6. Groove
7. Stabilizer Brackets
8. Left Lift Link
9. Right Lift Link
10. Left Lower Link
11. Right Lower Link
12. Left Stabilizer
13. Right Stabilizer
14. Restraining Chains
15. Leveling Crank Lock
16. Stabilizer Stow Clips

The right lift link incorporates the leveling screw which is adjusted by means of the leveling screw crank (2). The leveling screw crank is turned to obtain the desired position of the hitch sockets relative to one another.

A leveling crank lock (15) is provided to prevent the leveling screw from working down when operating equipment in the field.

NOTE: When the groove (6, Fig. 17) on each link is aligned with the top edge of the link housing, the lift links will be in their normal length.

The left and right lift links are made "rigid" or "free to float" by the position of the quick-attachable cotter pins in the lift link housings.

When the lift links are "free to float," they allow independent vertical movement of each lower link. This is required by equipment having wide spaced gauge wheels. The lift links are used "rigid" for equipment such as plows.

The left lift link may also be adjusted by disconnecting it from the rockshaft arm (1) and rotating the lift rod.

In rigid position, vertical float to follow ground contour is provided by the floating action of the rockshaft and both lower links move simultaneously.

HITCH LOWER LINKS (10 and 11, Fig. 17)

The hitch lower links are the connection between the equipment hitching pins, by means of the swivel sockets at the rear of the links, and the hitch points on the machine. They are attached to the machine at the two pivot pins in the rear axle carriers.

The lower links must be attached to the lower hole in the axle carrier at all times.

HITCH UPPER LINK (3, Fig. 17)

The length of the hitch upper link can be shortened or lengthened by using the hitch upper link adjusting handle. Turn the handle clockwise to shorten the link or counterclockwise to lengthen the link. The length of the hitch upper link can be adjusted from 533 mm (21-inches) to 749 mm (29-1/2-inches).

Adjust the upper link to a length that does not allow the implement to hit the roll over protective structure (4 post ROPS only) rear cross member when the hitch is in the full raise position.

After adjusting, place the upper link adjusting handle (4) in line with the turnbuckle housing.

NOTE: When it is desirable to have the upper link raised out of the way, put the lower end of the upper link in hook on the draft control unit.

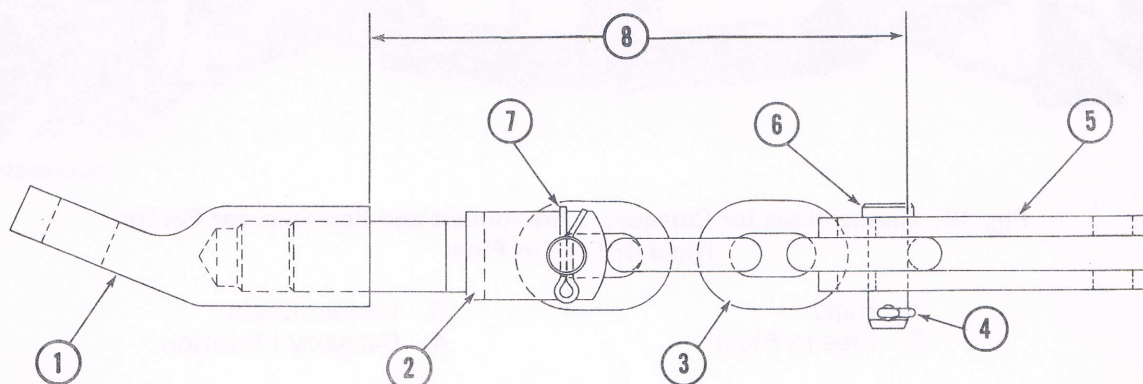
NOTE: *The upper link must be pinned in the upper hole of the machine bellcrank only when using power take-off operating equipment.*

For all other operations using Category I equipment the upper link must be pinned in the lower hole of the tractor bellcrank.

RESTRAINING CHAINS (15, Fig. 18)

Restraining chains are used to prevent excessive lateral movement of the hitch lower links (10 and

11). Consult the equipment operators manual for any variations in the use of restraining chains. The restraining chain length is set at the factory in a proper relation with the minimum working length of the lift links. If for any reason the length of the restraining chains has been temporarily altered, restore them to the normal length (8) 168 mm (6-5/8 inches) measured from the edge of the rear bracket to the inside edge of the front link. Rear bracket (1) must rotate freely on the lower link.



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Fig. 18. Restraining Chain Adjustment

- | | |
|--------------------------------|--|
| 1. Limiter Chain Rear Bracket | 6. Chain Shackle Strap Pin |
| 2. Limiter Chain Clevis | 7. Cotter Pin |
| 3. Lateral Limiter Chain | 8. Restraining Chain Normal Length 168 mm (6-5/8 inches) |
| 4. Quick-Attachable Cotter Pin | |
| 5. Chain Shackle Strap | |

NOTE: *When operating Category I equipment the front shackle strap and restraining chain must be assembled with the pins in hole marked "1" on shackle strap. Refer to Fig. 19.*

STABILIZERS (12 and 13, Fig. 17)

When lateral movement of the equipment is not desirable, stabilizers are available. Use the stabilizers when and as instructed in the equipment manual. The stabilizers are used with some direct-connected equipment.

Attach the front ends of the stabilizers to the stabilizer brackets (7), using a headed pin and a quick-attachable cotter pin.

The stabilizers can be lengthened by turning them counterclockwise, or shortened by turning them clockwise.

The rear ends of the stabilizers are attached to the hitching pins on direct connected equipment. The stabilizers are put on after the hitch lower link swivel sockets are in place and both are made secure with the klik pins.

POWER TAKE-OFF

When using three-point hitch direct-connected power take-off driven equipment, the left and right lift links must be set as specified in the equipment manual. Stabilizers must be used to limit the lateral movement of the equipment.

OPERATING THE MACHINE

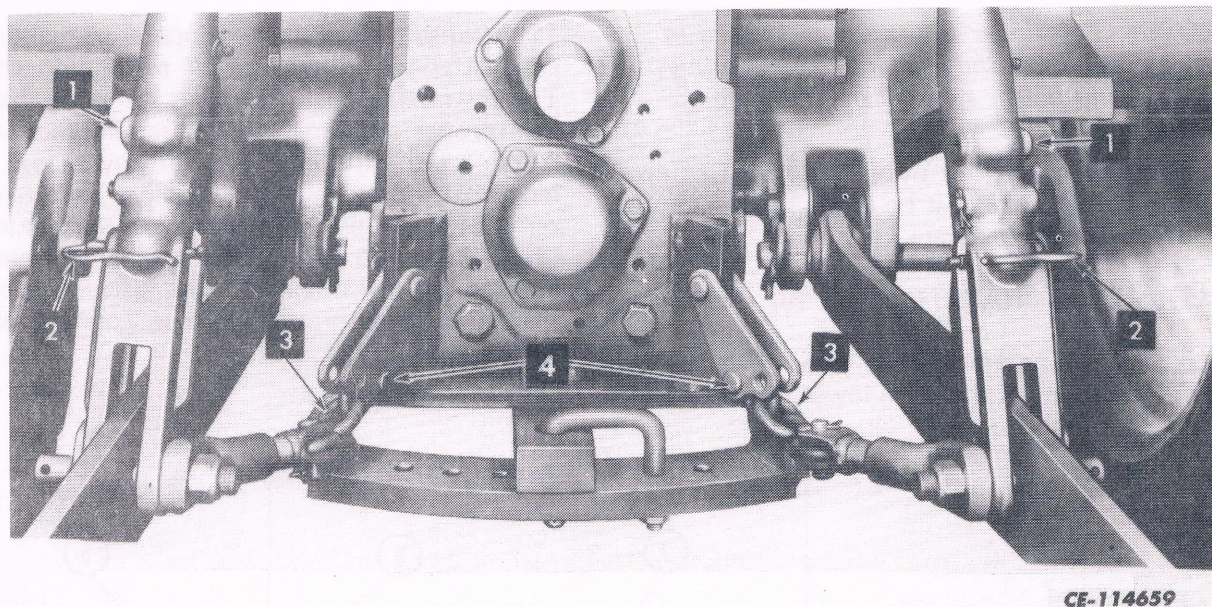


Fig. 19. Connections for Category 1 Equipment and Positions for Pin for Rigid or Free to Float

- | | |
|------------------|------------------------|
| 1. Rigid | 3. Limiter Chain |
| 2. Free to Float | 4. Category I Position |

The swinging drawbar adjusts to provide a standard hitch distance for power take-off operation of trailing-type equipment. Refer to "SWINGING DRAWBAR" in this section.

When using power take-off driven equipment, lock the swinging drawbar in the center position using the U-bolt and hex nut. Refer to "SWINGING DRAWBAR" in this section.

COUPLING THE EQUIPMENT

The three-point hitch on your machine is designed to be used with Category I equipment.

The Category I designation means that the hitch lower links will fit equipment hitching pins spaced 683 mm (26-7/8-inches) (4, Fig. 20) between the shoulders, the swivel sockets in the ends of the lower hitch links will fit the 22 mm (7/8-inch) (3) diameter equipment hitching pins, and the swivel socket on the hitch upper link will fit the 19 mm (3/4-inch) (1) hitching pin on the equipment mast. The space at the top of the mast is 44 mm (1-3/4-inches) (6).

The two lower links and the upper links have swivel sockets at one end to fit the smaller hitch pins for Category I equipment.

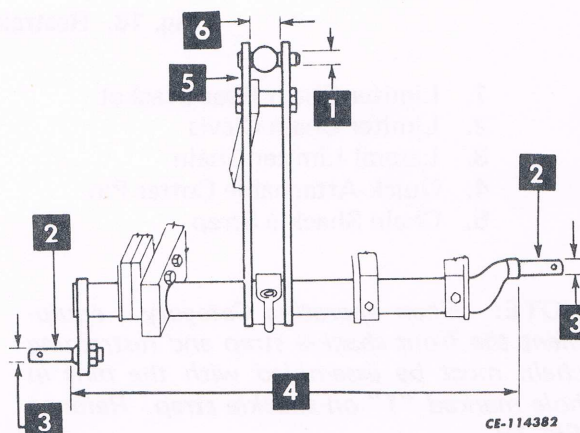


Fig. 20. Dimensions for Category I Equipment

- | |
|---------------------------|
| 1. 19 mm (3/4 inch) |
| 2. Hitch Pin |
| 3. 22 mm (7/8 inch) |
| 4. 683 mm (26-7/8 inches) |
| 5. Mast |
| 6. 44 mm (1-3/4 inches) |

EXAMPLE OF OPERATING THE THREE-POINT HITCH WITH DRAFT CONTROL

Coupling equipment to machines with three-point hitch is relatively simple, but it requires a little thought and practice to do the job quickly and without lost motion. New hitches and equipment often need to be "broken in" to work best.

Be sure the uses of the position control and draft control levers are fully understood. Spend a little time observing the action of the hitch when it is moved by these levers.

Set the position control lever as required to locate the hitch lower links at the same height as the equipment hitching pins.

Hitching is easier if the equipment and the machine are on reasonably level ground.

Back the machine straight in until the swivel sockets at the ends of the lower link rear sections are in line with the equipment hitching pins. Lift the latches at the rear ends of the lower links and pull out the lower link rear sections. Put the swivel socket onto the left equipment pin and insert the klik pin from the storage hole and the shield from the tool box. Similarly assemble the right swivel socket and the klik pin and shield, adjusting the leveling crank if necessary.

Remove the klik pin and hitching pin from the upper link. Adjust the hitch upper link so the swivel socket lines up between the hitching pin holes in the mast. Put the hitching pin through the mast holes in the swivel socket in the hitch upper link. Insert the klik pin. Shorten the upper link to its normal operating length. Raise the equipment.

UNCOUPLING THE EQUIPMENT

Lower equipment to the ground. Remove the klik pins from the three hitching points of the equipment. If the pins are difficult to remove slightly raise or lower the hitch with the position control lever until the pins are free.



CAUTION! The draft control lever must be fully forward whenever the equipment is disconnected.

REMOVING THE THREE-POINT HITCH LINKAGE

If for any reason the three-point hitch linkage is to be removed, proceed as follows:

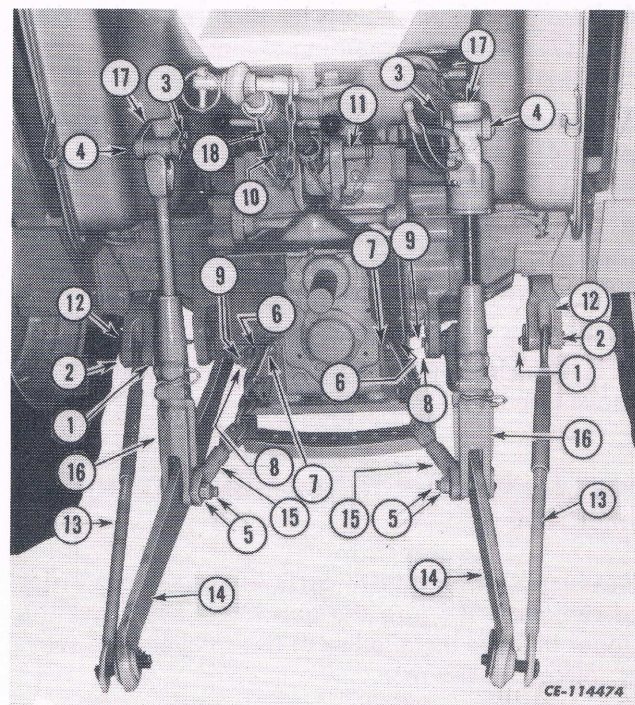


Fig. 21. Hitch Linkage Removal

1. Q. A. Cotter Pins
2. Stabilizer Pins
3. Q. A. Cotter Pins
4. Upper Lift Link Pins
5. Nuts and Bolts
6. Q. A. Cotter Pins
7. Restraining Chain Pins
8. Q. A. Cotter Pins
9. Lower Link Pins
10. Q. A. Cotter Pins
11. Locking Pin
12. Mounting Brackets
13. Stabilizers
14. Lower Links
15. Restraining Chains
16. Lift Links
17. Rockshaft Arms
18. Upper Link

1. Remove the Q. A. cotter pins (1) and headed pin (2) from the bracket (12) on the rear axle carriers. Remove the stabilizers (13).

2. Place suitable jacks or blocking under the lower links (14).

3. Remove the nuts and bolts (5) securing the restraining chains (15) and lift links (16) to the lower links (14).

OPERATING THE MACHINE

4. Remove the Q. A. cotter pins (6) and headed pins (7) holding restraining chains (15) from rear frame.
5. Remove the Q. A. cotter pins (3) and headed pins (4) securing lift links (16) to the rockshaft arms (17). Remove the lift links.
6. Remove the Q. A. cotter pins (3) and lower link pins (9) securing lower links (14) to rear axle carriers. Remove the lower links.
7. Remove Q. A. cotter pin (10) and locking pin (11) securing upper link (18) to bellcrank. Remove upper link.

INSTALLING THE THREE-POINT HITCH LINKAGE

Reassemble the linkage parts in the reverse order of removal. Be sure the two lower links and the upper link are installed with the smaller hole swivel sockets to the rear.

NOTE: *The lower links and restraining chains must be attached to the lower holes in the axle carriers and drawbar support when re-assembling.*

SWINGING DRAWBAR

The swinging drawbar is free to swing the entire width of the support bar, or when desired, can be locked in a stationary position.

When using a swinging drawbar to pull trailing-type equipment which does not require close positioning, the drawbar tongue may be left free to swing, making steering under load easier both on the straight-way and when turning and permitting shorter turns in working small or irregular fields.



CAUTION! When towing loaded wagons or heavy equipment downhill or on the highway with a swinging drawbar; lock the swinging drawbar in the center position.

When using the swinging drawbar on machines having the three-point hitch, push the draft control lever (on the quadrant) all the way forward and pull the position control lever all the way back so the lower links are in the raised position.

In this position the hitch will not interfere with the side movement of the swinging drawbar and

the position control lever will not interfere with the operation of the independent power take-off control lever.

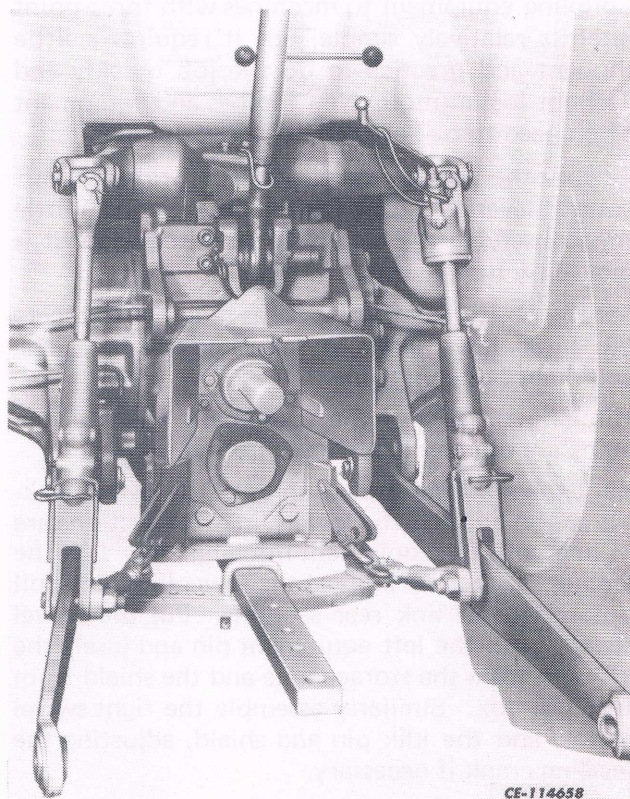


Fig. 22. Three-Point Hitch with Swinging Drawbar In Extended Position

On machines with the three-point hitch, the swinging drawbar, when in the extended positions (Fig. 22), provides the standard hitch distances from the end of the power take-off shaft to the center line of the hitch hole (7, Fig. 23) for power take-off operation of trailing-type equipment.

The swinging drawbar has two holes in its forward end and may be locked in two extended positions by the pivot pin. When using the power take-off, place the pin (3, Fig. 23) through the second hole (4) from the forward end of the swinging drawbar to obtain the standard 356 mm (14-inches) hitch distance.

NOTE: *The swinging drawbar must be locked in the center position for power take-off operation of trailing-type equipment.*

Lock the swinging drawbar in the center position using the "U" bolts and a hex nut at the threaded end. Refer to Fig. 22 and 23.

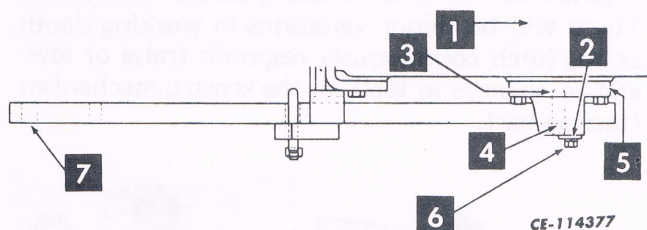


Fig. 23. Swinging Drawbar on Machines with Three-Point Hitch

1. Front of Machines
2. Pivot Pin Lock Plate
3. Pivot Pin
4. Pivot Pin Hole
5. Pivot Support
6. Bolt and Lockwasher
7. Hitching Hole

STORAGE POSITION

The swinging drawbar can be pushed completely forward to storage position.

Remove the nut and "U" bolt. Remove the bolt (6, Fig. 23), lockwasher (6), lock plate (2), and pivot pin (3) from the pivot support (5) underneath the rear frame. Push the drawbar to the side and replace the pivot pin so that it passes alongside the drawbar. Replace the lock plate and fasten with the bolt and lockwasher.

Slide the drawbar forward and line up the rear hitching hole with one of the holes in the drawbar support. Install the "U" bolt through the hitching hole and through the drawbar support, and replace hex nut.

HITCH CONTROLS

Semi-mounted and direct-mounted equipment are controlled by two levers in a quadrant; the position control lever (nearest the operator) and the draft control lever.

The operator can use the draft sensing feature of the hitch to provide a greater transfer of equipment weight to the machine when needed, thereby increasing traction while maintaining a constant load, or he can make the draft sensing inoperative.

The illustrations accompanying the following explanations are only examples. Working conditions and operator preference in each case must govern the exact positions of the levers.



CAUTION! Never park the equipment in the raised position. Moving the control lever will lower the equipment even though the engine is not running.

Position Control Lever (Fig. 24)

The position control lever is always used to raise or lower all hitch mounted equipment between the working position and the transport (highest) position. To raise the hitch (equipment) to transport, the position control lever is moved to the rearmost position in the quadrant. To lower the equipment, the position control lever is moved forward until the equipment has been lowered to the desired working position. The hitch is at its lowest position when the position control lever is placed at the offset near the front of the quadrant.

The position control lever is always used when operating with equipment (implements) that is not draft controlled, such as post hole diggers, cranes, platform carriers, etc. Implements of this type may be held at any desired position within the complete lift range of the hitch. The position of the hitch-mounted equipment is directly related to the location of the position control lever in the quadrant.

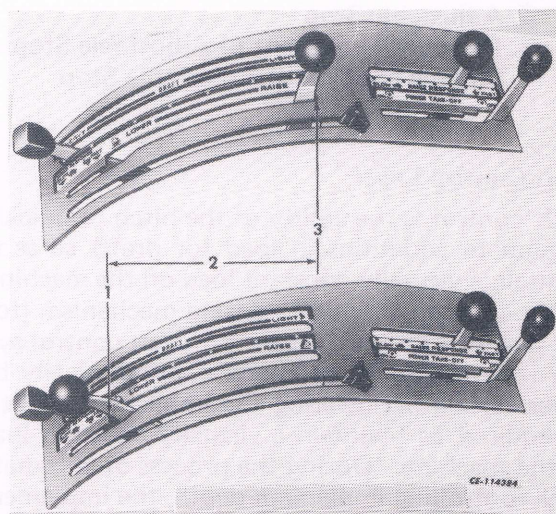


Fig. 24. Position Control (inside) Lever Showing Maximum Raise and Lower Positions (Draft Control in Extreme Forward Positions)

1. Maximum Lower
2. Operating Range of Lift
3. Maximum Lift

OPERATING THE MACHINE

Adjustable Stop (Fig. 25)

An adjustable stop (2) is provided for use whenever it is desirable to return the position control lever from transport to the same operating position. If the operator wishes to move past the stop to temporarily change operating position, the lever may be deflected outward to clear the stop. The stop may be moved to the rearmost point (4) of the quadrant to remove it from the operating range of the position control quadrant.

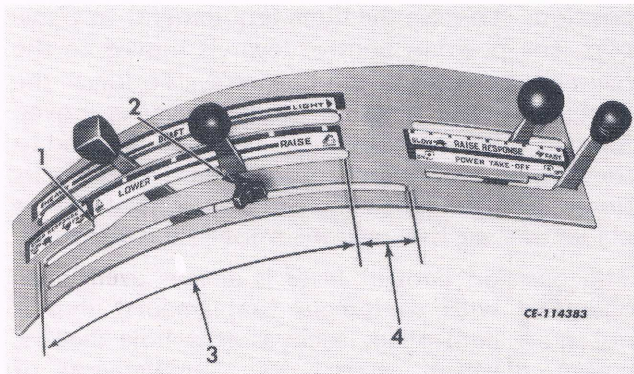


Fig. 25. Adjustable Stop Being Used to Return Position Control Lever to the Same Operating Position

1. Offset
2. Adjustable Stop
3. Range of Movement of Adjustable Stop
4. Storage Position of Adjustable Stop

Draft Control Lever

Draft control is the ability of the hitch to quickly respond to variations in load (or draft) so as to maintain a virtually constant load on the machine. As the load on the hitch sensing mechanism (top link and torsion bar) varies, the draft control system responds to these changes automatically by either raising or lowering the implement slightly as required to maintain a virtually constant load on the machine. During the process of automatically controlling implement depth, the implement is partially supported by the hitch, thereby transferring weight to the rear wheels to increase traction.

When soil texture (sand, foam, clay, etc.) and conditions (wet, dry, hard, etc.) are uniform, the hitch automatically maintains a nearly constant depth across the field. The draft control handle does not have to be moved from its initial setting.

This is true even while working across rolling land. There will be minor variations in working depth as the hitch continuously responds (raise or lowers) to changes in load on the sensing mechanism (torsion bar).

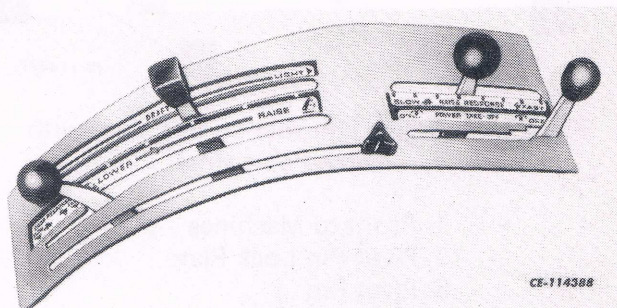


Fig. 26. Starting Below-ground-working Equipment in the Ground. Draft Control Lever Position Governs Depth of Operation

The draft control handle must be moved to maintain a nearly constant depth when significant changes in soil texture and conditions are encountered. For example, plowing in a field where soil texture changes from loam to clay during each pass through the field. The minor variations in working depth will be nearly the same in the clay or loam soil; however, it will be noted that the working depth will tend to decrease (shallowing) as the implement passes from the loam to the clay soil. This can be corrected by moving the draft control lever slightly forward until the desired depth is again obtained. The reverse of this procedure is used when the implement passes from clay to loam to prevent the implement from digging in too deeply.

To lower the implement from transport to the ground, the position control lever is moved to the offset in the quadrant. The draft control lever initially should be positioned midway in the quadrant. If the implement is operating too shallow, the draft control lever is moved forward in the quadrant until the desired depth is obtained. If the implement is operating too deep, move the draft control lever towards the rear of the quadrant until the desired depth is obtained. After the draft control lever is set to obtain the desired working depth with the particular implement mounted on the machine, only minor adjustments in lever position to accommodate varying soil conditions will be required. The position control lever is used to raise and lower the implement at the end of field without moving the draft control lever.

When operating in a field with extreme variations in soil, such as sand at one end and heavy clay at the other, a bottom limit (or depth limit) can be established by placing the position control lever slightly to the rear of the offset so the implement will not go below this predetermined depth when going through the sand. The placing of the draft control lever then establishes the desired load and operating depth for operating in the heavy clay.

The draft control may be made inoperative (locked out) (1, Fig. 27) by placing the draft control lever at the forwardmost location in the quadrant. The draft control handle should be placed in this location when operating implements that require only position control.

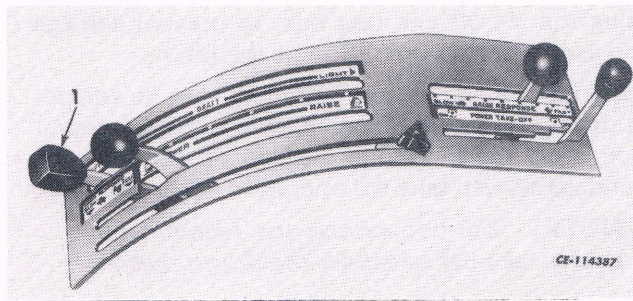


Fig. 27. Draft Control Lever in Locked Out Position

Raise Response (Fig. 28)

The position control lever should be placed at the offset in the quadrant to utilize the full range of the raise response control. The raise response is overridden when the position control lever is moved to the maximum raise position, therefore maximum raise speed is obtained. When the position control is again placed at the offset in the quadrant to lower the implement at the end of the field, the raise response or raise speed automatically returns to that preselected by the position of the raise response lever.

The raise response should be used as follows: The raise response lever should be placed at the "FAST" position (1, Fig. 28) and the implement lowered by moving the position control lever to the offset in the quadrant.

The raise response provides an adjustment to the speed that the hitch will raise when operating in draft control.

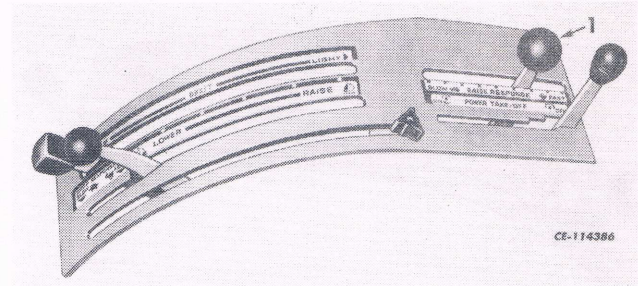


Fig. 28. Raise Response Lever

The draft control lever is then adjusted to provide the desired working depth. If the implement tends to jump when the hitch raises, causing rapid changes in working depth or backing of the machine, the raise response lever can be gradually moved toward the SLOW position until the jump or backing is reduced to a desirable level. Move the lever only far enough to reduce the jump or jerk.

Once the desired raise response is obtained no further adjustment of the raise response control should be required, and the hitch may be raised and lowered at the end of the field without affecting raise response setting.

When operating in a field condition where the terrain varies rapidly (crossing swale or terrace) or traction is poor, it may be necessary to move the raise response lever back toward FAST to prevent the implement from digging in too deeply and causing the machine to get stuck or "spin out." Again only move the lever far enough toward FAST to obtain satisfactory operation. If the above-mentioned field condition is encountered intermittently or occasionally during the pass through the field, the operator may find it desirable to move the raise response lever to FAST only when crossing the varying terrain and then return the lever to a slower position to provide more desirable performance for the majority of the pass through the field.

Drop Response (Fig. 29)

The drop response provides an adjustment to the speed that the hitch will lower when operating in draft control. The lowering speed can be gradually decreased by moving the position control toward the forward end of the quadrant beyond the offset.

OPERATING THE MACHINE

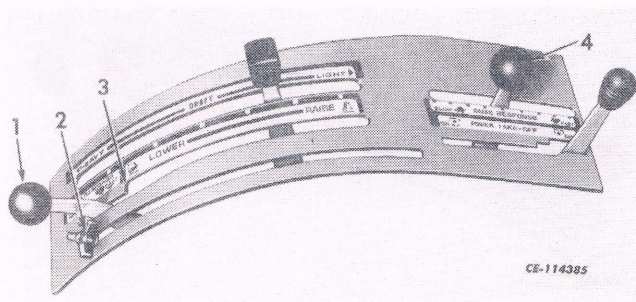


Fig. 29. Position Control Lever Set for Slow Drop Response

1. Position Control Lever in the Drop Response Range
2. Adjustable Stop
3. Offset
4. Raise Response Lever

The drop response should be used as follows: The implement is lowered by moving the position control lever (1) to the offset (3) in the quadrant and the draft control and raise response levers adjusted as described previously. If the raise response (4) is in a position where the implement chatters or machine still tends to buck, the position control lever (1) should be gradually moved down the drop response slot until the desired operating condition is obtained.

The adjustable stop (2) should then be located ahead of the position control lever to serve as a stop to which the position control lever may be returned each time.

When lowering the implement at the end of the field, the operator should first move the position control lever to the offset in the quadrant and allow the implement to reach the desired working depth.

When the implement is at the desired depth, the position control lever should be moved to the stop (set as described above) which will provide the desired lowering rate.

If the implement tends to gradually decrease working depth or float out of the ground when crossing varying terrain, the lowering rate may be too slow.

This can be corrected by moving position control lever toward fast drop response until the desired operation is obtained.

OPERATING THE INDEPENDENT POWER TAKE-OFF



CAUTION! When pulling power equipment, be sure that all power line shielding is in place and in good order.

When using direct connected power take-off driven equipment, the left and right lift links must be set as specified in the equipment manual.

NOTE: *On machines with a three-point hitch, stabilizers must be used to limit the lateral movement of the equipment.*

Pin the swinging drawbar in the storage position. Lock the swinging drawbar in the center position, using the U-bolt and hex nut to prevent damage and assure proper operation of the hitch.

Advance the engine speed control lever to the position where the indicator needle on the tachometer is on the PTO line marked on the dial, for standard power take-off operation of the machine.

NOTE: *Do not exceed the recommended power take-off speed for the driven machine.*

The machine motion can be started or stopped in any of the forward or reverse speeds, without affecting the speed of the power take-off shaft. Also, the power take-off shaft can be started or stopped without affecting the speed of the machine.



CAUTION! Stop the power take-off before dismounting from the machine.



CAUTION! Power take-off protection tube must always be installed over power take-off shaft whenever the safety shield is removed.



CAUTION! Always keep the shaft covered with the safety shield.

ENGAGING OR DISENGAGING THE POWER TAKE-OFF (Fig. 30)

The independent power take-off clutch operating lever (1) allows the operator to regulate the speed

of the clutch engagement so that a smooth engagement may be obtained under all conditions.

Move the operating lever out of the notch in the quadrant and slowly move the operating lever forward to the offset (feathering position) (2) in the quadrant.

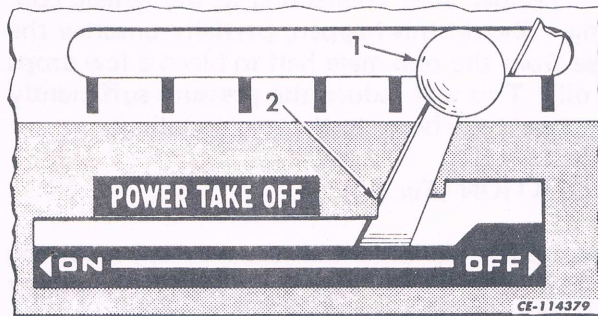


Fig. 30. Power Take-Off Control Lever

1. Power Take-off Lever
2. Offset (Feathering Position)

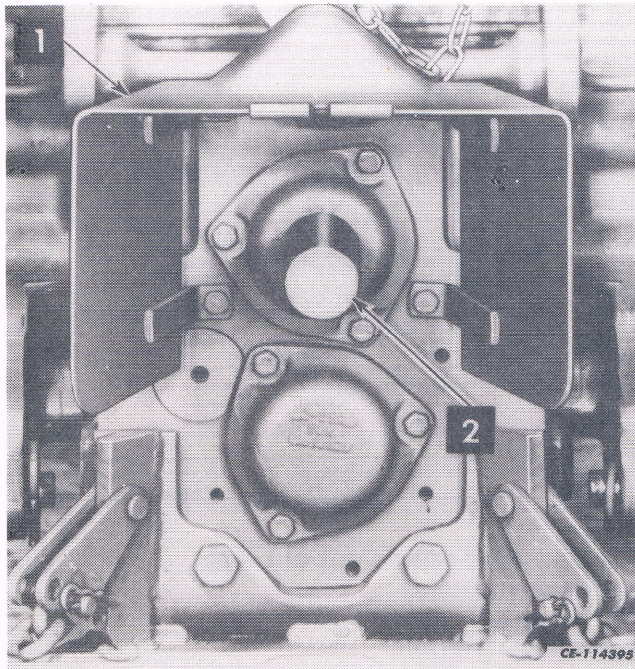


Fig. 31. Safety Shield and Tube in Place

1. Safety Shield
2. Safety Tube

Hold the lever in this position until the driven machine is up to speed, then slowly move the lever fully forward. To obtain a smooth engagement under extremely light or heavy loads, the operating lever may be held in intermediate positions as required.

When attempting to free plugged equipment, do not continuously slip the clutch as any clutch can be damaged by excessive slippage.

Do not allow the clutch to slip longer than three seconds at any time.

To disengage the power take-off shaft, move the operating lever rearward all the way.

Hydrostatic Transmission Only: It is normal for the transmission oil pressure warning light to flash on if the independent power take-off is slowly engaged or disengaged.

OPERATING THE AUXILIARY VALVES

GENERAL

One or two auxiliary valves may be added on the right side of the machine to provide hydraulic control of various mounted and trailing-type equipment.

Hydraulic flow for the auxiliary valves is provided by the bypassed flow from the flow divider valve of the basic pump system.

Each valve provides independent lifting and lowering and may be set for float operation when equipment is to follow the ground contour. However, when the levers are operated at the same time, the cylinder with the lightest load will move before the more heavily loaded one moves.

The inner or single control lever operates the rear hydraulic outlets.

The use of the levers will depend on the type of equipment used with the machine.

CONNECTING HOSES TO VALVE PORTS

The proper hose should be connected to the valve port; to assure that the implement will raise when the auxiliary valve levers are moved rearward, and lower when they are moved forward. Reverse the hoses if the implement works the opposite way.

OPERATING THE MACHINE

NOTE: *The engine must not be operated until auxiliary valve bottom ports are connected to rear remote tubes, hoses to implement cylinders, or plugged with O-ring plugs.*

CONNECTING HOSES TO REMOTE BREAK-AWAY COUPLINGS (Fig. 32)

Rear remote control break-away mounting is standard for the rear self-sealing couplings operated by the inner control lever to provide a break-away feature for trailing-type equipment.

NOTE: *It is recommended that the gold colored male coupling, identified with a 1.6 mm (1/16-inch) wide groove on the hex part of the body; and the gold colored female coupling, identified with a 1.6 mm (1/16-inch) groove next to the collar; be used as a pair, to insure maximum performance.*

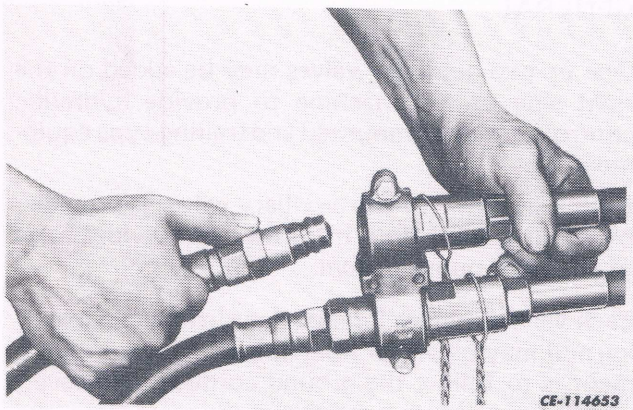


Fig. 32. Connecting the Self Sealing Breakaway Couplings (Typical Illustration)

The collar or lock ball retainer on the female coupling is rigidly held so that the coupling body must be pulled rearward to insert the hose end.

To connect the self-sealing couplings in the break-away bracket, pull the female coupling rearward and insert the male coupling all the way then, ease back the female coupling to lock the two halves together. After both couplings are connected, actuate the control valve momentarily in both directions to open the coupling poppets.

THERMAL EXPANSION PRESSURE

Occasionally, thermal expansion pressures in the cylinder lines, while disconnected from the machine, can build in excess of the maximum pressures of the machine system. This would make it impossible for the tractor pressure to open the male poppet after connecting to the female coupling. Should this happen, partially unscrew the hose from the one male half to bleed a few drops of oil. This will reduce the pressure sufficiently to connect the hoses to the rear couplings.

OPERATION (Fig. 33)

To raise the equipment all the way up, move the control lever all the way back (2). To partially raise the equipment, when it is desirable to ease the load as when hitching equipment, move the auxiliary valve control lever backward slowly just enough to secure the proper lift. To lower equipment move the control lever forward to the lower position (4). Push the lever all the way forward to provide float (5) required by some equipment to follow ground contour.

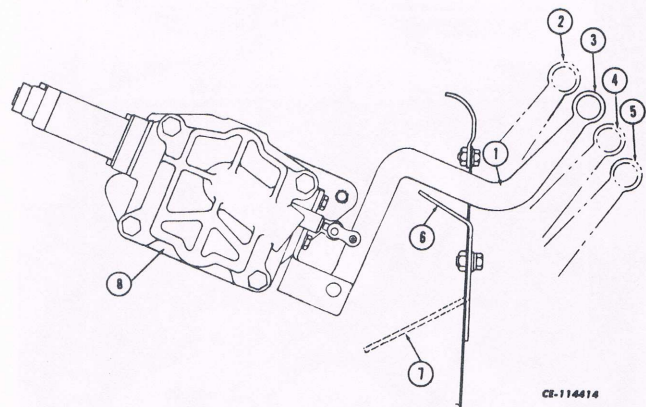


Fig. 33. Auxiliary Valve Control Lever Positions

1. Auxiliary Valve Control Lever
2. Raise (Detent)
3. Neutral
4. Lower (Detent)
5. Float (Detent)
6. Position of Bracket with Float Locked Out
7. Storage Position
8. Auxiliary Valve

If the lever has been moved to detent positions during raising or lowering, it will automatically return to neutral when the piston stroke has been completed or an adjustable piston stop contacted. When the lever has been moved fully forward to provide the equipment with float, it will remain in the float position until manually returned to another position.

The float lockout bracket in front of the auxiliary valves may be set (6) to limit the forward travel of the levers so they cannot be accidentally moved into the "float" position (5).

When float is desired, remove the hex nuts and turn the bracket to the lower position (7). Then tighten the hex nuts.

ADDING FLUID AFTER CONNECTING CYLINDERS AND HOSES

When using a large single-action cylinder, check transmission fluid level when the piston rod is extended. Refer to "HYDRAULIC SYSTEM" in Section 8.

AIR IN THE HYDRAULIC SYSTEM

The entire system must be kept tightly sealed at all times, not only to prevent loss of fluid, but also to avoid entrance of air in the inlet end of the system. Air entering the system interferes with proper lubrication of the moving parts.

Air causes an increased amount of vibration and an unsteady pressure. The presence of air in the system will be noticed by a noise in the pump or by the pump laboring under high pressure. Proper filling of the reservoir and working the system during the filling process as previously described will work the air out of the system.

Freeing the System of Trapped Air

Start the engine and operate it at a moderate idle speed. Slowly move the control levers back and forth ten or twelve times through their full range of travel. Move the steering wheel, first to one extreme, then to the other, and then back to center. This frees the system of trapped air.

STOPPING THE MACHINE (SYNCHROMESH TRANSMISSION)

NOTE: Step numbers correspond with the numbers shown in Fig. 34.

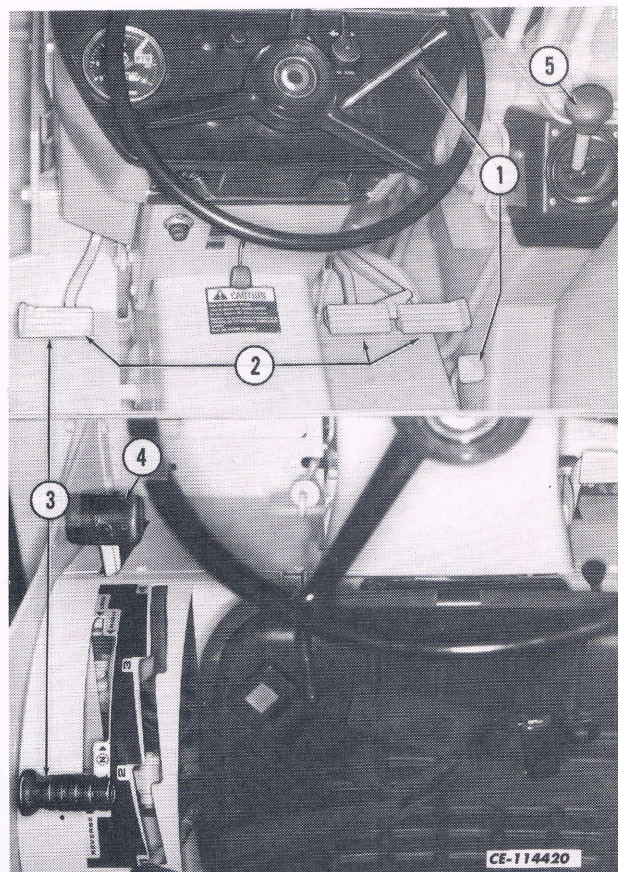


Fig. 34. Stopping the Machine Equipped With Synchromesh Transmission

NOTE: To make a sudden or emergency stop, depress the brake pedals and clutch pedal simultaneously.

1. Fully release the accelerator pedal or retard the engine speed control lever.
2. Depress (disengage) the clutch pedal and apply the brakes until the machine comes to a complete stop.
3. With the clutch pedal still depressed, move the transmission range shift lever to the "N" (neutral) position, then release the clutch pedal.

NOTE: The transmission range lever can remain in gear when the machine is brought to a temporary stop if the clutch pedal is kept depressed (disengaged) and the operator does not leave the operator's compartment.

4. Apply the parking brake.
5. Lower all mounted equipment to the ground (if equipped).

OPERATING THE MACHINE

STOPPING THE MACHINE (HYDRO-STATIC TRANSMISSION WITH HAND CONTROL)

NOTE: Step numbers correspond with the numbers on Fig. 35.

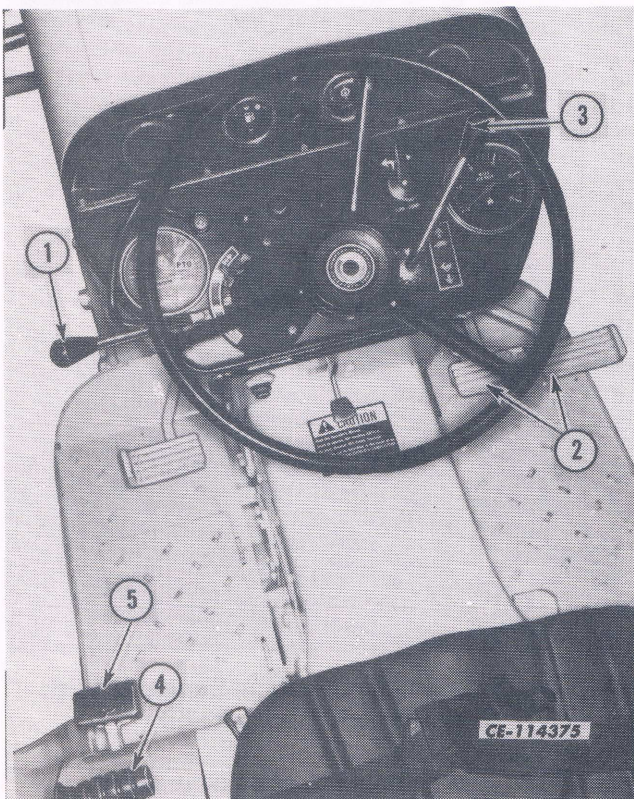


Fig. 35. Stopping the Machine Equipped With Hydrostatic Transmission With Hand Control

NOTE: To make a sudden or emergency stop, depress the brake pedals and dump pedal simultaneously.

1. Move the directional lever to "N" (neutral).
2. Apply the brakes if necessary.

NOTE: Under normal working conditions moving the directional control lever to "N" (neutral) position will bring the machine to a gradual halt. However, under some conditions it will be necessary to stop the machine faster. When this type of condition occurs, depress the brake pedals to stop the machine.

3. Fully retard the engine speed control lever.

4. Move the transmission range shift lever to the "N" (neutral) position.

NOTE: The transmission range lever can remain in gear when the machine is brought to a temporary stop and the operator does not leave the operator's compartment.

5. Apply the parking brake.
6. Lower all mounted equipment to the ground. (If equipped).

STOPPING THE MACHINE (HYDRO-STATIC TRANSMISSION WITH FOOT CONTROLS)

NOTE: Step numbers correspond with the numbers on Fig. 36.

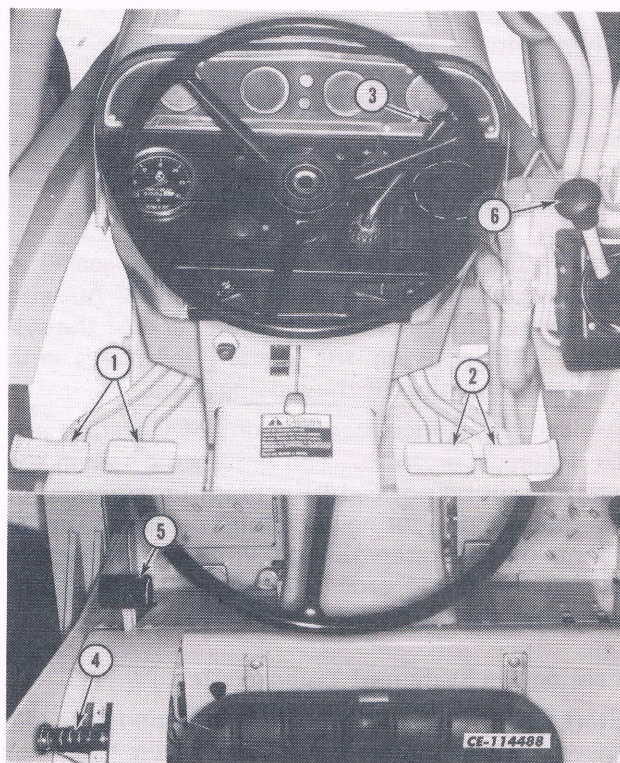


Fig. 36. Stopping the Machine Equipped With Hydrostatic Transmission With Foot Controls

NOTE: To make a sudden or emergency stop, depress the brake pedals and dump pedal simultaneously.

1. Fully release the forward or reverse directional pedals.
2. Apply the brakes if necessary.

NOTE: Under normal working conditions the releasing of the hydrostatic control pedal (forward or reverse) will bring the machine to a gradual halt. However, under some conditions it will be necessary to stop the machine faster than it would be by the release of the hydrostatic control pedal. When this type of condition occurs, depress the brake pedals to stop the machine.

3. Fully retard the engine speed control lever.
4. Move the transmission range lever to "N" (neutral) position.

NOTE: The transmission range lever can remain in gear when the machine is being brought to a temporary stop and the operator does not leave the operator's compartment.

5. Apply the parking brake.
6. Lower all mounted equipment to the ground (if equipped).

STOPPING THE MACHINE (TORQUE CONVERTER TRANSMISSION)

NOTE: Step numbers correspond with the numbers in Fig. 37.

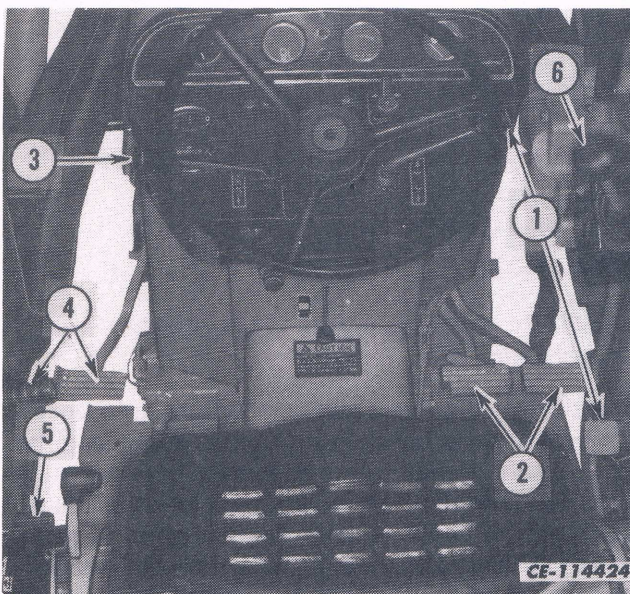


Fig. 37. Stopping the Machine Equipped With Torque Converter Transmission

NOTE: To make a sudden or emergency stop, depress the brake pedals and torque converter dump pedal simultaneously.

1. Fully release the accelerator pedal or retard the engine speed control lever.
2. Apply the brakes until the machine comes to a complete stop.

NOTE: When operating the loader, the dump pedal can be fully depressed thereby neutralizing the transmission and actuating the brakes to hold the machine stationary. This allows all engine power to be utilized for the hydraulics.

Do not use the dump pedal in place of the brake pedals for normal machine stops. The dump pedal brake feature is intended for the above use only.

3. Move the forward/reverse control lever to the "N" (neutral) position.

NOTE: The forward/reverse lever should always be put in "N" (neutral) position and locked in place with the neutral lock lever anytime the machine is parked, whether the engine is running or not.

4. Depress the dump pedal and move the transmission range lever to the "N" (neutral) position. Then release the dump pedal.

NOTE: The transmission range lever can remain in gear when the machine is brought to a temporary stop if the forward/reverse control is moved to "N" (neutral) or the torque converter dump pedal is kept depressed and the operator remains in the operator's compartment.

5. Apply the parking brake.
6. Lower all mounted equipment to the ground (if equipped).

PARKING THE MACHINE



CAUTION! Never leave machine unattended while the engine is running.

A few "DO" suggestions to protect both lives and equipment when parking.

DO park machine in area free of grease or fuel puddles which cause tire deterioration.

DO lower hydraulically supported loader equipment to the ground to reduce injury possibilities and to gain machine stability.

OPERATING THE MACHINE

DO park machine on level ground, if at all possible:

- a. To avoid unexpected movement.
- b. To obtain accurate coolant, lubricant and fuel level checks.

DO park on level ground when possible. If necessary to park on slope, park at right angle, then secure with blocks (front and rear).

NOTE: *Parking on a steep slope is not recommended.*

DO place the range transmission shift lever in "N" (neutral) position before leaving the operator's compartment.

NOTE: *Always apply the parking brake when parking the machine.*

Torque Converter Transmission Only:

Place forward/reverse lever in "N" (neutral) position and lock in place with the neutral lock lever.

STOPPING THE ENGINE

NOTE: *Step numbers correspond with the numbers shown in Fig. 38.*

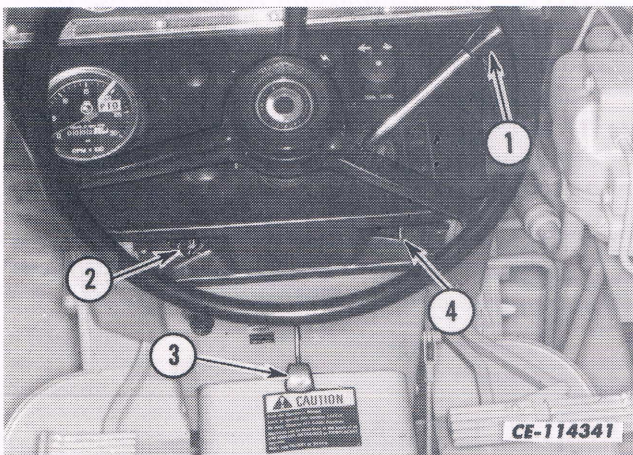


Fig. 38. Stopping The Engine

1. Run the engine at approximately 1500 rpm until the engine coolant temperature gauge reaches its lower normal position. This will allow lubricating oil and coolant to carry heat away from the combustion chamber, bearings, shafts, etc.

NOTE: *Serious damage can result to the engine if the above step is neglected.*

2. If on, turn the light switch to the off position.
3. Move the fuel shutoff control lever to the "OFF" position.
4. Turn the ignition key to the off position.

NOTE: *When the machine is shut down at the end of each day or if the machine is to be left unattended, the ignition switch may be locked by removing the key.*

IDLING

Long periods of idling are not good for an engine because operating temperatures drop so low the fuel may not burn completely. This will cause carbon to clog the injector and piston rings.

If the engine coolant temperature becomes too low, raw fuel will wash lubricating oil off of cylinder walls and dilute the crankcase oil so all moving parts will suffer from poor lubrication.

NOTE: *If the machine is not being used, shut it down.*

SHUTDOWN

NOTE: *Stop the engine immediately if any parts fail.*

Practically all failures give some warning to operator before parts fail and ruin engine. Many engines are saved because alert operators heed warning signs (sudden drop in oil pressure, unusual noise, etc.) and immediately shut down engine. A delay of ten seconds after bearing failure causes a knock, may result in a ruined crankshaft or allow a block to be ruined by a broken connecting rod.

Never try to make the next trip or another load after the engine indicates that something is wrong. It does not pay.

GENERAL



CAUTION! Always proceed with caution when traveling with the bucket in the raised position.

Terrain footing conditions, type of materials being worked, and maneuvering space determine the speed at which the machine can be worked. When the bucket is at work, keep the engine speed running at full governed speed and operate in "L" low transmission range. Use "H" high range for traveling purposes. The techniques for using the machine described below are not intended as all inclusive. Each work situation will vary. Machine operation must be altered for each particular application to use the machine to best advantage.

When possible, start all jobs from relatively level ground. If necessary, level an area large enough to provide sufficient working space for the loader. This prevents back and forth pitching of the loader and will result in easier digging.

Avoid wheel spinning whenever possible; this wastes effort and only converts a relatively smooth working area into ruts and piles that pitch and tilt the machine. In cold weather, this material can freeze and cause additional difficulty the following day.

DOWNGRADE OPERATION

Before going downgrade, select the proper transmission gear range. In steep downhill operation, decelerate the engine and use the foot brakes if necessary to reduce the speed of the machine and overspeeding the engine.

OPERATING OVER AN OBSTRUCTION

When crossing ridges, rocks or logs, it must be done slowly and if possible, at an angle. This slows the fall, lessens the danger of upsetting the tractor and reduces the fall jolt which can be harmful to the operator and machine. Decelerate the engine, then gradually increase the power as the machine moves forward, over, and down. If the load is light, it may also be necessary to use the foot brakes.

LOADING, TRANSPORTING AND PILING USING THE LOADER

When loading from a bank or stockpile, use the V-method shown in Fig. 1, or the step-loading method shown in Fig. 2. Keep the trucks close to the work area to minimize loader travel. Keep work areas clean and level. When possible, spot the next truck to be loaded on the opposite side.

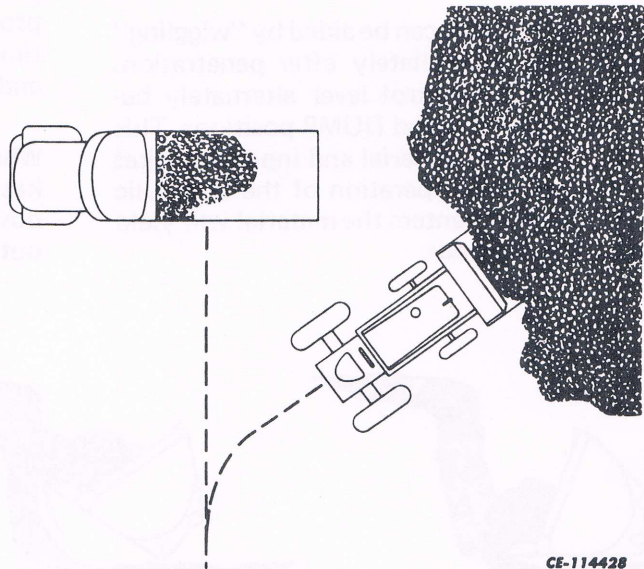


Fig. 1. V-Loading Method

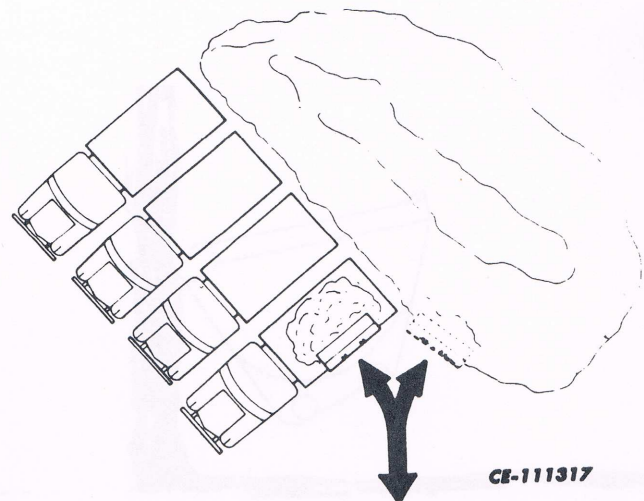


Fig. 2. Step Loading Method

OPERATING TECHNIQUES

Approach the pile with the engine running at full governed speed. Lower the bucket so the forward motion of the tractor will push the bucket into the material.

While the bucket is being pushed forward into the pile, pull the control lever diagonally back toward you, which rolls the bucket back and raises the boom. This action of "moving in" and rolling the bucket back, simultaneously is called "crowd action."

Digging in hard material can be aided by "wiggling" the bucket edge immediately after penetration. Operate the bucket control lever alternately between its ROLL BACK and DUMP positions. This action will loosen the material and improve bucket loading. Coordinated operation of the hydraulic control as the bucket enters the material will yield satisfactory bucket loads.

NOTE: *The boom assembly need not be fully raised to load the bucket. Maximum bucket loading will be obtained before the bucket reaches operator eye level.*

When bank loading, keep the cutting edge flat, as shown in Fig. 4. Tilting the bucket back too far forces the flat of the cutting edge against the bank, preventing the bucket from digging. This non-productive maneuver causes waste of power and time and possible damage to the bucket cylinders and linkage.

When stockpiling, move each load only once and keep travel distance down to a minimum. When possible, locate stockpiles as close as possible without hindering other work on the site.

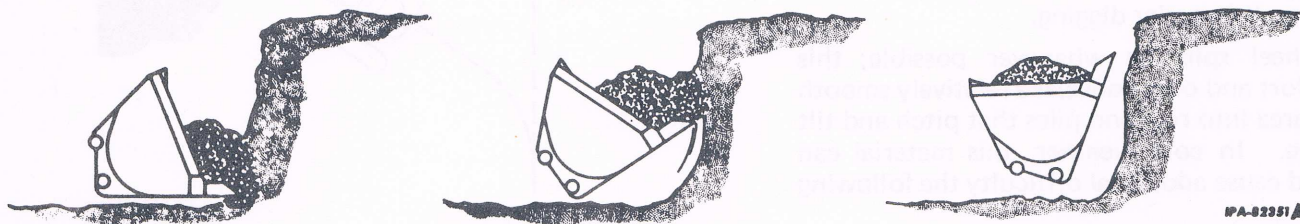


Fig. 3. Bank Loading (Typical Illustration)

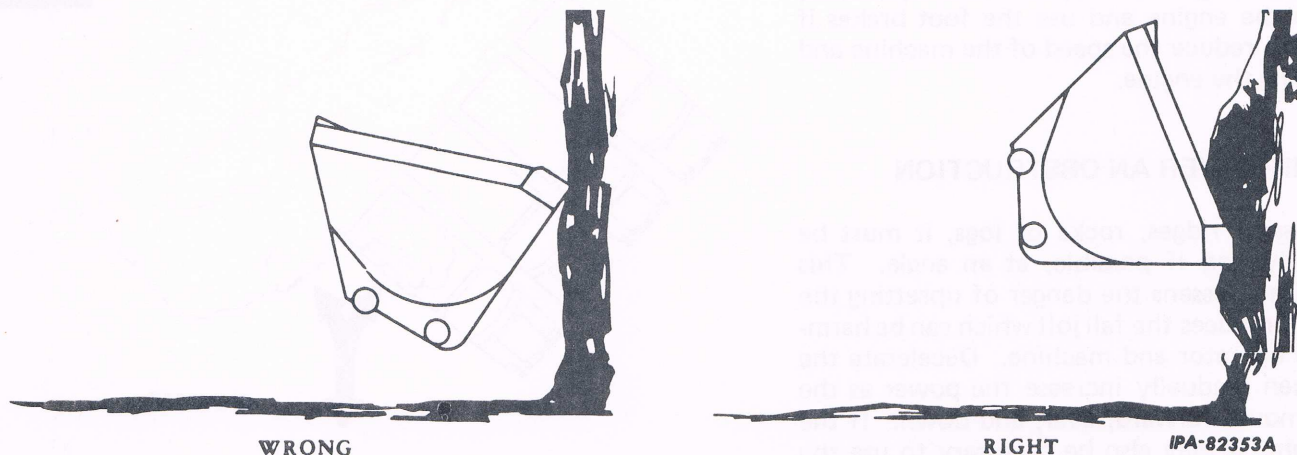


Fig. 4. Bucket Position for Bank Loading (Typical Illustration)

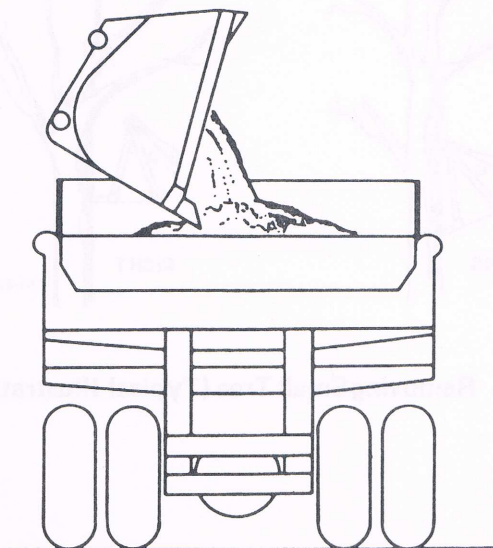


CAUTION! A loaded bucket should never be transported with the boom fully raised.

TRANSPORT POSITION

When transporting material, raise the boom arms to give the same ground clearance as provided by the machine. A loaded bucket must never be transported in the fully raised position. Keep the travel speed reasonable for safe operation. Upon reaching the truck, raise the bucket high enough to clear the truck body. Reduce forward speed and dump load slowly. This will reduce the shock of weight transfer to the rear axle when the bucket is emptied. Shake bucket only to loosen dirt from within.

Before dumping a large rock(s) into a truck, put enough loose rock or dirt into the truck first to act as cushioning material. Place large rocks into center of truck from as low a height as possible.



CE-105321

Fig. 5. Dumping into Truck (Typical Illustration)

After the bucket empties, move the control lever into the ROLL BACK position. Back the loader away from the dump area, lower the boom and return to the loading site.

Lower loaded or unloaded bucket to ground when waiting for any length of time.

DIGGING, CLEARING AND LEVELING USING THE LOADER

Plan the excavating job so most of the work can be done with the machine being driven forward out of the excavation rather than being backed out. Use as flat a ramp as possible.

When digging or excavating, level the bucket with the ground. Use the boom to force the bucket cutting edge into the ground as the machine moves forward. If the cutting edge does not penetrate the ground immediately, angle the bucket cutting edge slightly to give better penetration. As the cutting edge penetrates, adjust the bucket cutting depth and bucket slightly to maintain as good a grade as possible. When the bucket is full or at the end of the cut, roll the bucket back and raise it to clear the ground. Carry the load to the desired dump area.

Always feed the bucket into the ground gradually until the desired depth of cut is obtained. When selecting the gear range and determining the depth of cut, allow for an increase in resistance as the load increases. It may be necessary to raise the lift arms slightly to obtain greater traction.

Reduced loader effort is required when material can be moved downhill.

Snow can act as an insulating blanket and reduce or eliminate the need for ripping. Therefore, remove snow only from the area to be worked each day; leave the rest to insulate the ground.

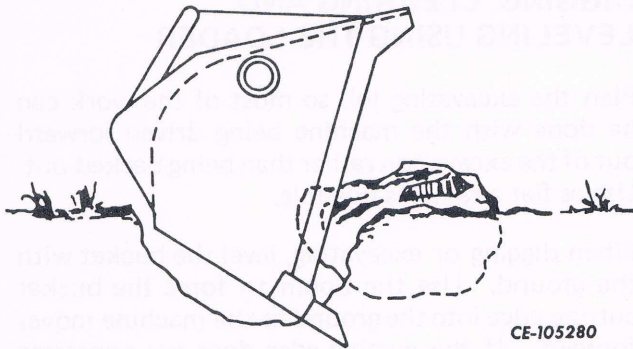
When the ground is hard or frozen and the area must be ripped before it can be worked, rip a relatively small section and work it to grade before enlarging the cut. This will require ripping each section only once, not every morning after the ground has refrozen.

When clearing a rocky area, remove the small and loose rocks first; large and solid rocks can then be loosened and moved with less difficulty.

When loosening large or solid rocks, greater force and penetration can be obtained by digging under the rock with the bucket (Fig. 6). Lifting the rock with the bucket while pushing will increase traction and reduce wheel spinning.

OPERATING TECHNIQUES

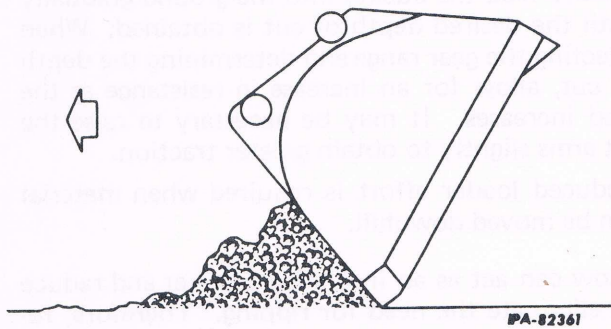
NOTE: *Never travel forward with the bucket in a complete DUMP position on the ground. Serious damage to loading mechanism can result.*



CE-105280

Fig. 6. Large Rock Removal (Typical Illustration)

When backdigging or leveling, keep the bucket cutting edge level with the ground as the machine is moved backward (Fig. 7). Lift the bucket off the ground when moving forward to begin a new drag so it will not cut in.

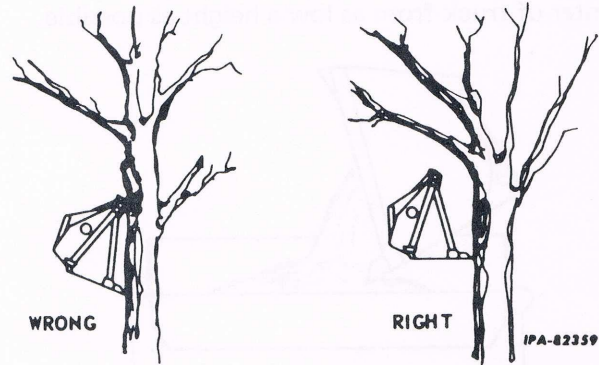


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Fig. 7. Backdragging or Leveling (Typical Illustration)

When clearing trees, raise the bucket high to gain leverage. Make contact gently to reduce possible harm to the operator and loader. The bucket must be positioned with the bottom parallel with the ground. **DO NOT** push with the top of the bucket (Fig. 8).

Heavy roots of large trees may require cutting from several sides of the tree. Use a cable to topple and remove trees from soft ground.



IPA-82359

Fig. 8. Removing Small Tree (Typical Illustration)

Scheduled maintenance is the normal maintenance necessary to provide proper and efficient equipment operation. To protect your investment and prolong the service life of your equipment, follow the scheduled maintenance listed below.

SCHEDULED MAINTENANCE GUIDE

Every 10 Hours of Operation

Cooling system	Check level of coolant in radiator. Check radiator and oil cooler fins for cleaning and damage. Refer to "COOLING SYSTEM" in Section 8.
Fuel filters	Drain water and sediment. Refer to "FUEL SYSTEM" in Section 8.
Fuel Tank	Fill. Refer to "FUEL SYSTEM" in Section 8.
Hydraulic system	Check for leaks. Correct any found.
Scheduled lubrication	Refer to "SERVICE GUIDE" in this section.

Every 50 Hours of Operation

Battery	Check fluid level. Refer to "ELECTRICAL SYSTEM" in Section 8.
Belts	Check tension and replace belts when necessary. Check more often in an abrasive environment. Refer to "BELTS" in Section 8.
Tires	Check inflation pressure. Check tires for cuts, bruises and imbedded stones or other foreign material. Refer to "TIRES" in Section 8.

Every 100 Hours of Operation

Air cleaner dust unloader	Squeeze to be sure the rubber lip seal is not blocked. Refer to "AIR CLEANING SYSTEM" in Section 8.
Air cleaner hose connections and clamps	Inspect for and correct loose fits or damage.
Scheduled lubrication	Refer to "SERVICE GUIDE" in this section.

Every 200 Hours of Operation

Air cleaner	Clean element. Check connections for leaks. Refer to "AIR CLEANING SYSTEM" in Section 8.
Clutch pedal (synchromesh transmission only) ..	Check for free movement. Refer to "CLUTCH" in Section 8.
Hydrostatic drive housing oil filter bypass screen (hydrostatic transmission only)	Clean bypass screen when transmission filter is changed. Refer to "HYDRAULIC SYSTEM" in Section 8.
Lights	Check operation. Replace burned out bulbs. Refer to "ELECTRICAL SYSTEM" in Section 8.
Scheduled lubrication	Refer to "SERVICE GUIDE" in this section.

SCHEDULED MAINTENANCE

Periodic or Every 1000 Hours of Operation

Air cleaner element	Replace the element after 2000 hours of operation or sooner if operating in severe conditions. Refer to "AIR CLEANING SYSTEM" in Section 8.
Brake pedals	Check free movement. Refer to "BRAKES" in Section 8.
Cooling system	Clean. Refer to "COOLING SYSTEM" in Section 8.
Engine valves	Adjust valve lash. Refer to "ENGINE" in Section 8.
Fuel filters	Replace when necessary. Refer to "FUEL SYSTEM" in Section 8.
Fuel injection nozzles	See your international PAY [®] line distributor.
Machine	Clean engine and machine. Refer to "SERVICE POINTS" in this section.
Parking brake lever	Adjust. Refer to "BRAKES" in Section 8.
Seat belt	Check for damage and replace if necessary. Refer to "SEAT BELT" in Section 8.
Scheduled lubrication	Refer to "LUBRICATION GUIDE" in this section.
Transmission breather	Remove and clean. Refer to "HYDRAULIC SYSTEM" in Section 8.
Wheel bolts	Check torque. Refer to "SPECIAL TORQUES" in Section 9.

LUBRICATION

GENERAL

For information about the lubrication of a new machine, refer to "LUBRICATION WHEN SHIPPED" in Section 2.

The life and performance of a machine depends on the care that it is given, and proper lubrication is an important maintenance service for your machine.

Thorough lubrication service performed at definite intervals will aid greatly in prolonging the life of the machine and in reducing operating expenses.

The type of work being done, load, ground and weather conditions are all factors to consider in frequency of lubrication. The scheduled intervals between lubrication periods shown on the "SER-

VICE GUIDE" are approximate, being based on average operating conditions. It may be necessary to lubricate after shorter working periods under severe operating conditions such as extremely dusty conditions, low engine temperatures, intermittent operation, excessively heavy loads with high oil temperatures, or when diesel fuel with a high sulphur content is used. However, the time intervals between lubrication periods must never exceed those indicated in this manual.

SELECTION OF LUBRICANTS

The selection of the proper type (specification) and grade (weight or viscosity) of lubricant is not guess work. Many tests have been made to determine the correct lubricants for this machine. For detailed information regarding lubricants, refer to "LUBRICANT SPECIFICATIONS AND CAPACITIES" in this section.



Lubricant Viscosities

During cold weather, base the selection of a crankcase lubricating oil viscosity on the lowest anticipated temperature for the day to make starting easier. For hot weather operation, base the selection on the highest anticipated temperature. Refer to the "LUBRICANT SPECIFICATIONS AND CAPACITIES CHART" in this section.

PRECAUTIONS

After changing engine oil, operate the engine at low idle, without load, for at least five to ten minutes. This will allow the oil to work into the bearings and onto the cylinder walls.

LUBRICANT SPECIFICATIONS AND CAPACITIES

It is not the policy of the International Harvester Company to approve lubricants or to guarantee oil performance in service. The responsibility for the quality of the lubricant must remain with the supplier of the lubricant. When in doubt, consult your authorized International PAY[®] line distributor for information given in the latest service bulletin on crankcase lubricating oils or grease lubricants.

The lubricants specified for the machine are shown in the "LUBRICANT SPECIFICATIONS AND CAPACITIES CHART" in this section.

SCHEDULED MAINTENANCE

LUBRICANT SPECIFICATIONS AND CAPACITIES CHART (U.S. MEASURE)				
LUBRICANT KEY: EO — Engine Oil		MPG — Multi-Purpose Grease		
LUBRICATION POINT	CAPACITY	49°C (+120°F) -7°C (+20°F)	21°C (+70°F) -23°C (-70°F)	-12°C (+10°F) -34°C (-30°F)
Engine Crankcase w/Filter Change	7.7 l. (8 qts)	EO — I.H. No. 1 Engine Oil or API CD/CC or CD Oil or MIL-L-2104C Oil or MIL-L-45199B (See NOTE)		
		Grade-30	Grade-10	Grade-10 (&)
Rear Frame (Common Reservoir for Transmission, Differential Case and Machine Hydraulics) Synchromesh Transmission PAYtractor PAYloader Hydrostatic Transmission PAYtractor PAYloader Torque Converter Transmission PAYloader	34 l. (9 gal.) 51 l. (13.5 gal.) 53 l. (14 gal.) 70 l. (18.5 gal.) 57 l. (15 gal.)	I.H. HY-TRAN® FLUID		
All Lubrication Fittings Front Wheel Bearings	Lubricate as Instructed	MPG — I.H. 251H EP (*) or I.H. Supergrease (*) or Equivalent No. 2 Multi-Purpose Lithium Grease		

(*) For the specifications, consult your authorized International PAY LINE distributor.

NOTE: Do not substitute with SAE-10W-30 or 10W-40.

(&) Below -17°C (0°F) use SAE-10W diluted 10% with kerosene.

SCHEDULED MAINTENANCE

SECTION 7
Page 5

MEMORANDA

SCHEDULED MAINTENANCE

SERVICE CHART

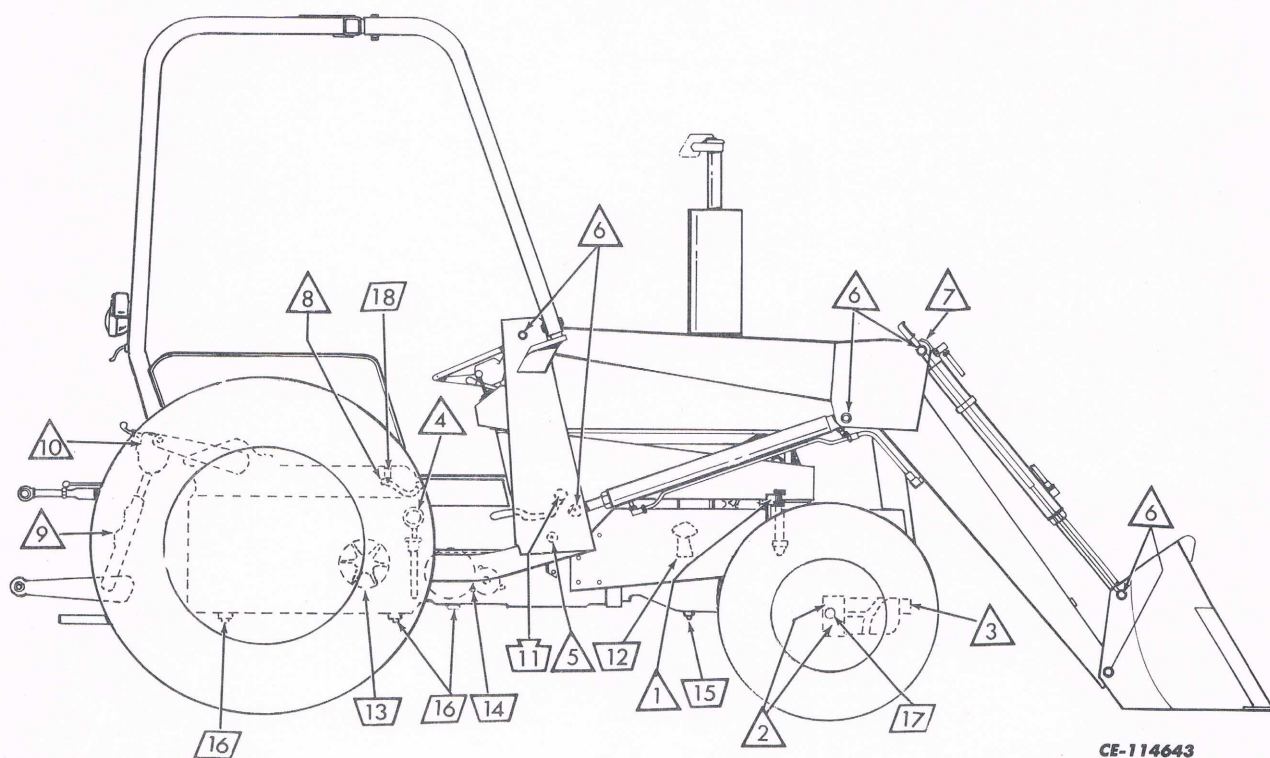


Fig. 1. Service Chart

NOTE: *Intervals of time between lubrication services are based on average operating conditions. Under unusually severe conditions of operation, reduce the interval of time between services.*

The symbols around the reference numbers indicate the intervals between service.




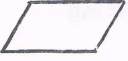
△ — 10 Hours □ — 100 Hours ▤ — 200 Hours ▥ — 1000 Hours

SCHEDULED MAINTENANCE

SECTION 7
Page 7

SERVICE GUIDE

NOTE: Points of service are individually explained under "SERVICE POINTS". They are identified by item numbers corresponding with those listed in the chart below and the tractor diagram. Always use clean lubricators and containers. Wipe dirt from fittings before fresh grease is added.

SERVICE INTERVAL	ITEM NO.	POINT OF SERVICE	LUBRICANT	REMARK
Every 10 Hours 	1.	Crankcase Oil Level	EO	Check
	2.	Steering Knuckles	MPG	Lubricate
	3.	Axle Pivot Pin	MPG	Lubricate
	4.	Hydraulic Fluid Level (Common Reservoir for Transmission, Differential and Hydraulics)	HY-TRAN	Check
	5.	Clutch Release Shaft (Synchromesh Transmission Only)	MPG	Lubricate
	6.	Loader Pivots (PAY [®] loader Only)	MPG	Lubricate
	7.	Self Leveling Pivot (PAY [®] loader Only)	MPG	Lubricate
	8.	Parking Brake Pivot	MPG	Lubricate
	9.	Three Point Hitch Lift Links	MPG	Lubricate
	10.	Three Point Hitch Leveling Screw	MPG	Lubricate
Every 100 Hours 	11.	Brake Pedals (R.H. Side)	MPG	Lubricate
Every 200 Hours 	12.	Crankcase Oil Filter	—	Replace
	13.	Hydraulic Fluid Filter	—	Replace
	14.	Transmission Filter (Hydrostatic Transmission Only)	—	Replace
	15.	Crankcase Oil	EO	Change
Every 1000 Hours 	16.	Hydraulic Fluid (Common Reservoir for Transmission, Differential and Hydraulics)	HY-TRAN	Change
	17.	Front Wheel Hubs	MPG	Repack
	18.	High Range Lock-Out Pivot (Torque Converter Transmission Only)	MPG	Lubricate

SCHEDULED MAINTENANCE

SERVICE POINTS

Item 1 — Crankcase Oil Level

Check the crankcase oil level. Refer to "ENGINE" in Section 8.

Item 2 — Steering Knuckles (Fig. 2)

(Four Fittings) Apply a lubricator, to the fittings (1) on top and bottom on both sides, until clean lubricant appears.

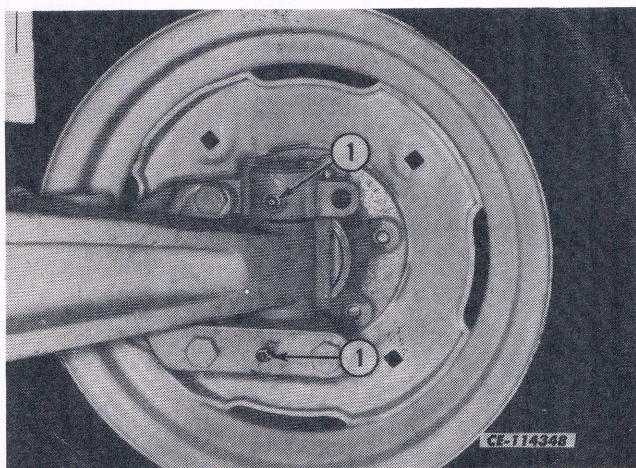


Fig. 2. Steering Knuckles Lubrication Fitting

Item 3 — Front Axle Pivot Pin (Fig. 3)

(One Fitting) Apply a lubricator to the fitting (1) until clean lubricant appears.

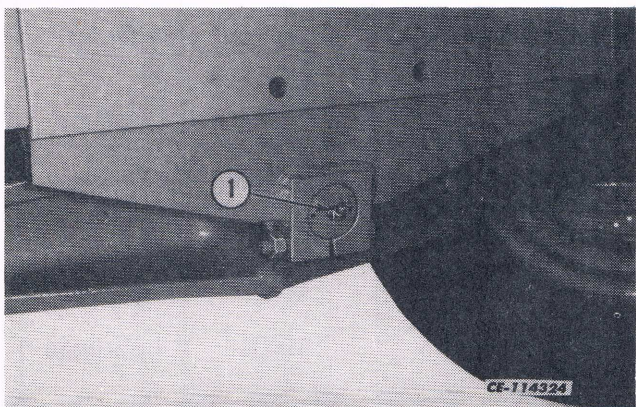


Fig. 3. Front Axle Pivot Pin Lubrication Fitting

Item 4 — Hydraulic Fluid Level

Check the hydraulic fluid level. Refer to "HYDRAULIC SYSTEM" in Section 8.

Item 5 — Clutch Release Shaft (Synchromesh Transmission Only) (Fig. 4 and 5)

(Two Fittings) Apply one or two strokes of a lubricator to each fitting (1).

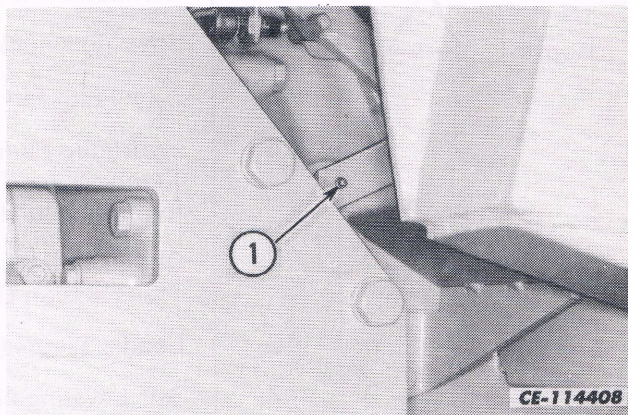


Fig. 4. L.H. Clutch Release Shaft Lubrication Fitting

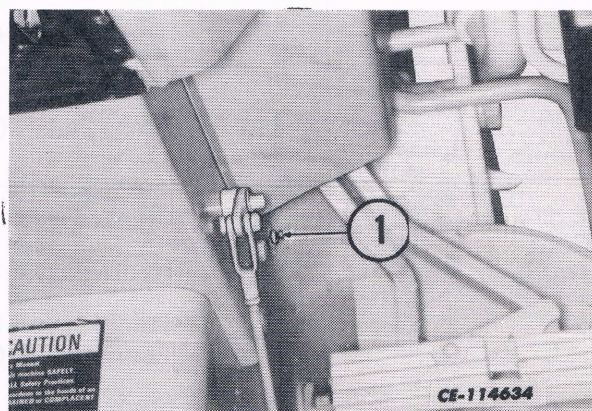


Fig. 5. R.H. Clutch Release Shaft Lubrication Fitting

Item 6 — Loader and Cylinder Pivot Points (PAY® loader Only)

(Twelve Fittings) Apply a lubricator to the fittings, on each pivot pin and both sides of the cylinders as shown in the "SERVICE CHART", until clean lubricant appears.

Item 7 — Self Leveling Pivot (PAY[®] loader Only) (Fig 6)

(One Fitting) Apply a lubricator to the fitting (1) until clean lubricant appears.

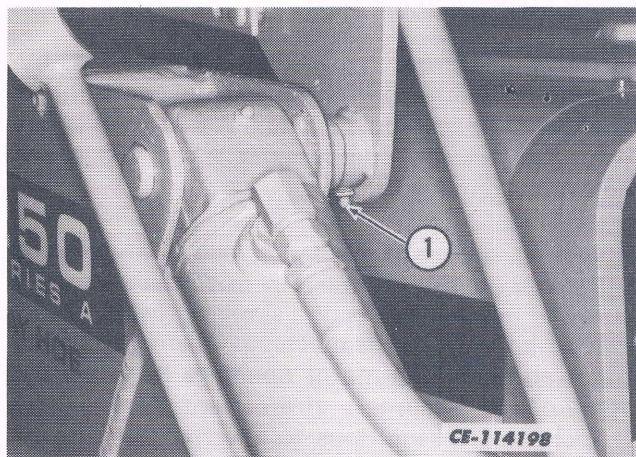


Fig. 6. Self-Leveling Pivot Lubrication Fitting
(Typical Illustration)

Item 8 — Parking Brake Pivot (Fig. 7)

(One Fitting) Apply a lubricator to the fitting (1) until clean lubricant appears.

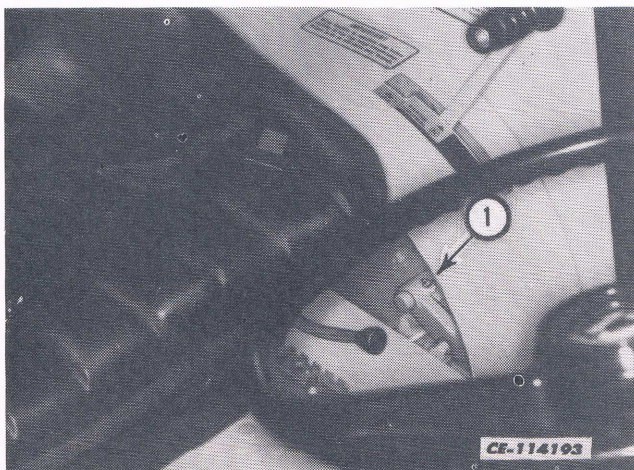


Fig. 7. Parking Brake Lubrication Fitting

Item 9 — Three Point Hitch Lift Links (Fig. 8)

(Two Fittings) Apply a lubricator to each fitting (1) until clean lubricant appears.

Item 10 — Three Point Hitch Leveling Screw (Fig. 8)

(One Fitting) Apply a lubricator to the fitting (2) until clean lubricant appears.

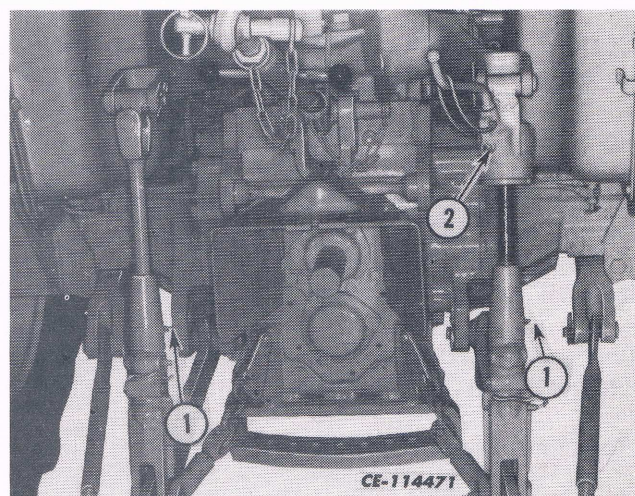


Fig. 8. Three Point Hitch Lubrication Fittings

1. Lift Link Lube Fitting
2. Leveling Screw Lube Fitting

Item 11 — Brake Pedals (Fig. 9)

(One Fitting) Apply a lubricator to the fitting (1) until clean lubricant appears.

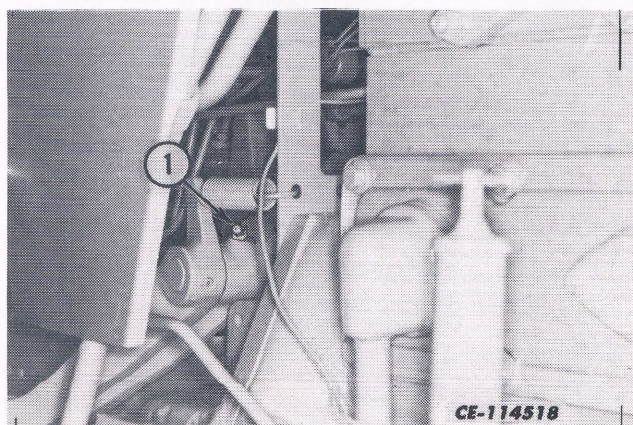


Fig. 9. Brake Pedal Lubrication Fittings

SCHEDULED MAINTENANCE

Item 12 — Crankcase Oil Filter

Replace the filter. Refer to "ENGINE" in Section 8.

Item 13 — Hydraulic Fluid Filter

Replace the filter and clean the by-pass screen. Refer to "HYDRAULIC SYSTEM" in Section 8.

Item 14 — Transmission Filter (Hydrostatic Transmission Only)

Replace the filter and clean the by-pass screen. Refer to "HYDRAULIC SYSTEM" in Section 8.

Item 15 — Crankcase Oil

Change the crankcase oil. Refer to "ENGINE" in Section 8.

Item 16 — Hydraulic Fluid

Change the hydraulic fluid. Refer to "HYDRAULIC SYSTEM" in Section 8.

Item 17 — Front Wheel Hubs

Repack the front wheel hubs. Refer to "WHEEL HUBS" in Section 8.

Item 18 — High Range Lock-Out Pivot (Torque Converter Transmission Only) (Fig. 10)

(One Fitting) Apply a lubricator to the fitting (1) until clean lubricant appears.

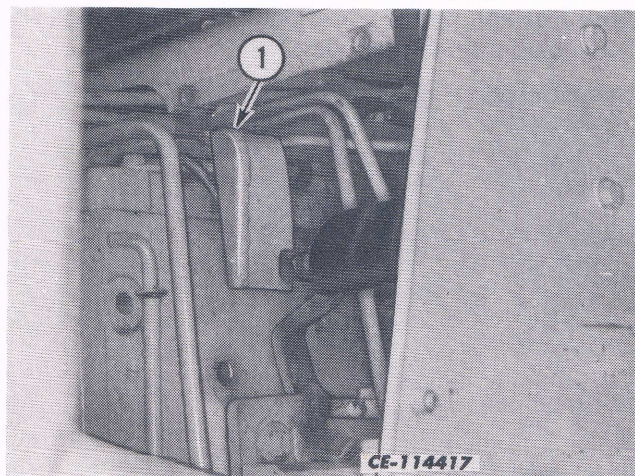


Fig. 10. High Range Lock-Out Pivot Lubrication Fitting

MISCELLANEOUS

Linkage

Occasionally lubricate the engine and control linkages with a few drops of oil.

Clean Engine and Machine

Remove dirt from the engine, transmission, hydraulic cylinders, axle and hydraulic connections. If allowed to accumulate, the dirt will find its way into the tractor components when plugs and covers are removed.

Steam is the most effective means of cleaning dirty equipment. If steam is not available, use a spray of mineral spirits or a similar solvent. Steam can be harmful to the machine. Protect the alternator and cranking motor openings from the full force of the steam jet. If a solvent spray is used, it must not be injurious to the hydraulic hoses, engine fuel lines or the insulation on electric wires. Apply fresh grease at all fittings on the tractor after cleaning.

PREPARATIONS FOR HOT OR COLD WEATHER

Proper maintenance and mechanical efficiency are assured during seasonal air temperature changes, when these instructions are followed.

FUEL SYSTEM

Refer to "FUEL SYSTEM" in this section for the diesel fuels which will give you the most satisfactory performances for your engine.

LUBRICATION

Lubricate the machine. Use the lubricants specified in the "LUBRICANT SPECIFICATIONS AND CAPACITIES CHART" in Section 7.

COOLING SYSTEM

Prepare the cooling system as follows:

1. Check the entire system for leaks.
2. Inspect the condition of all hoses. Replace hoses and hose clamps when necessary.
3. Check the operation of the thermostat by observing the engine coolant temperature gauge on the instrument panel during operation. If the engine warms up slowly, the thermostat may be stuck in the open position.

If the engine overheats, the thermostat may be inoperative by remaining closed.

If improper thermostat operation is indicated, refer to "COOLING SYSTEM" in this section for removal and installing procedure.

4. Clean cooling system. For this procedure, refer to "COOLING SYSTEM" in this section.

5. Check the tension and condition of the alternator, water pump and fan belt and adjust or replace if necessary. For these procedures, refer to "BELTS" in this section.

6. Remove all bugs or dirt from the radiator core using air or water under pressure. Direct the flow through the core, opposite the normal direction of air flow.

7. Clean the radiator guard and outside of core.

8. Protect your cooling system from damage by using I.H. permanent (Ethyl-Glycol based) anti-freeze. Refer to "COOLING SYSTEM" in this section.

ELECTRICAL SYSTEM

Remove all corrosion from battery terminals and cables. Repair or replace all wires which have worn, cracked or frayed insulation; also broken or loose wires. Service the battery. Refer to "ELECTRICAL SYSTEM" in this section.

AIR CLEANING SYSTEM

AIR CLEANER

The machine is equipped with a dry-type air cleaner with a replaceable element.

Air entering the air cleaner body is swirled causing the large heavy particles to pass to the outer surface and be deposited in the automatic dust unloader. The air then goes through the filter element which removes the remaining particles. The clean air then enters the intake manifold.

Detailed service procedures are covered in the following text.

GENERAL PRECAUTIONS

Frequently inspect all hose connections. If hoses show any signs of deterioration replace them.

To eliminate strain on the rubber hose connections, be sure the pipes line up.

All joints between the air cleaner and the engine must be tight. All gaskets must be in good condition and bolts must be drawn up tight.

Never operate the engine unless the element is in place and the dust unloader valve is installed.

NOTE: *Never attempt to remove the element from the air cleaner while the engine is running.*

REMOVING THE FILTER ELEMENT

1. Stop the engine. The engine should never run, under any conditions, without the element in place.
2. Loosen the element retaining clamp (2, Fig. 1) by pulling outward. Remove the one end from the slot and leave the clamp hanging.
3. Grasp the element (1, Fig. 2) by the seal and slowly remove it from the body by pulling straight out.

MAINTENANCE

CLEANING THE FILTER ELEMENT

NOTE: *The paper element must be handled with care. It will not stand the abuse of rapping on a tire or hard surface.*

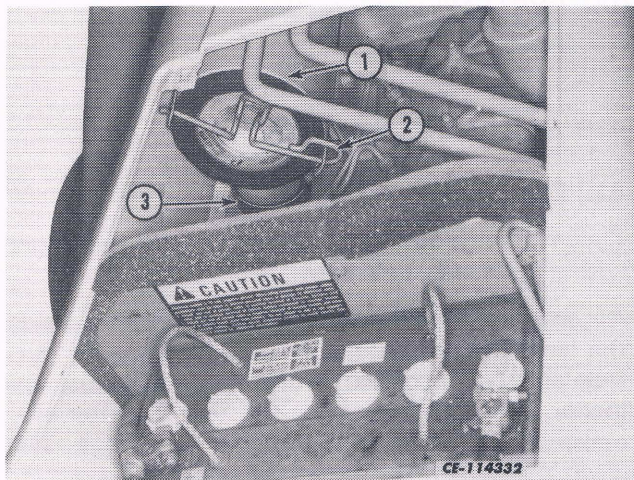


Fig. 1. Air Cleaner and Automatic Dust Unloader

1. Air Cleaner Body
2. Element Retaining Clamp
3. Dust Unloader

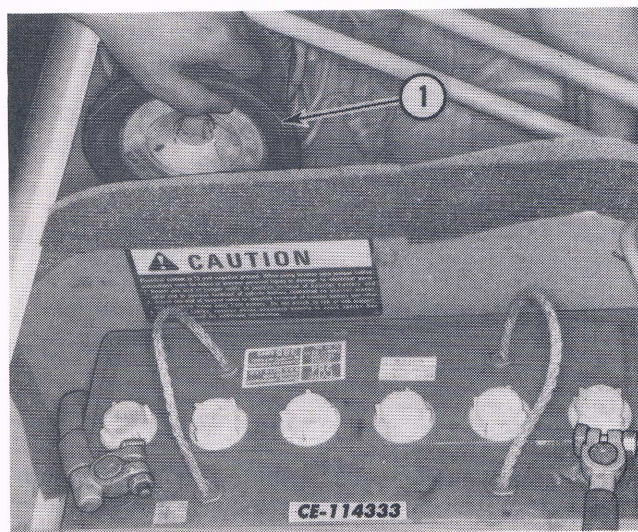


Fig. 2. Removal of the Filter Element

1. Filter Element

1. Direct clean, dry compressed air up and down the pleats on the "CLEAN SIDE" (inside) of the element. Continue this until the element is clean.

An element cleaning tool (No. 407 073 R1) for use with compressed air is available from your International PAY® LINE distributor. It will do a faster and more efficient job of removing dust than a regular air gun or nozzle.

NOTE: *Air pressure at the nozzle must not exceed 489 kPa (100 psi). Keep a reasonable distance between the air nozzle and element.*

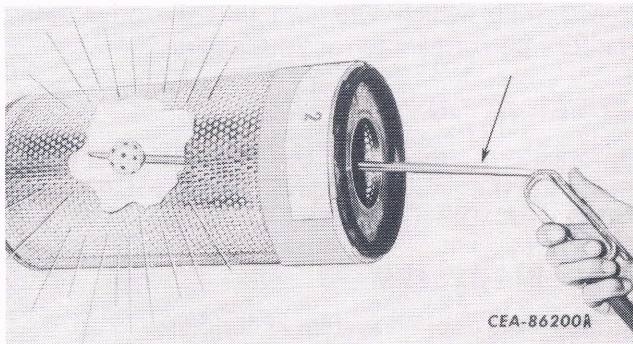


Fig. 3. Using Element Cleaning Tool

Replace the filter element after ten cleanings or 2000 hours, whichever comes first. If the operating conditions are very dusty, the element will require cleaning more frequently. A clean element is essential for efficient engine operation.

NOTE: *Do not attempt to clean this element by washing.*

INSPECTION AND INSTALLATION

1. Inspect the filter element for leaks or damage by placing a bright light inside the element. Inspection of the element on the outside will disclose any holes where concentrated light shines through. The slightest rupture requires replacement of the element.

2. Inspect the contact surfaces of the element and the air cleaner body. If faulty or damaged gaskets or surfaces are noted, correct these conditions immediately.

3. Remove any dirt, found inside the air cleaner body, with a damp cloth before reinstalling the element.

4. Before resuming operation, inspect and tighten all air cleaner and air induction system connections.

5. After installing the new or cleaned element, place the loose end of the clamp in the slot and press clamp to original position.

AUTOMATIC DUST UNLOADER

The unloader automatically allows the accumulated dirt in the air cleaner body to drop out when the weight of the dust overcomes the vacuum that keeps the unloader lips closed.

After every 100 hours of operation, and with the engine stopped, squeeze the dust unloader to be sure the rubber lip seal is not blocked.

NOTE: When installing the dust unloader on the air cleaner, be sure the flat side of the hose is in line and not broadside to the fan blast so the normal functioning of the dust unloader is not affected.

BELTS

Belts on new machines and replacement belts lose their tension as they seat into the pulley grooves and must be watched during break in periods. Check the tension of these belts at 1, 10 and 50 hour intervals to stabilize the belt tension. If the tension falls below a required minimum, the belt slips, damaging the belts and pulley grooves.

NOTE: When operating in abrasive type conditions, check the belts every 100 hours.

TENSION

The tension value applied to a new belt (initial installation only) is higher than the retension applied to a used belt (one that has been run five minutes or longer).

Checking Tension

Belt tensions are to be measured by means of a "Gates KRIKIT Gauge" to insure correct tensions. This gauge may be obtained from:

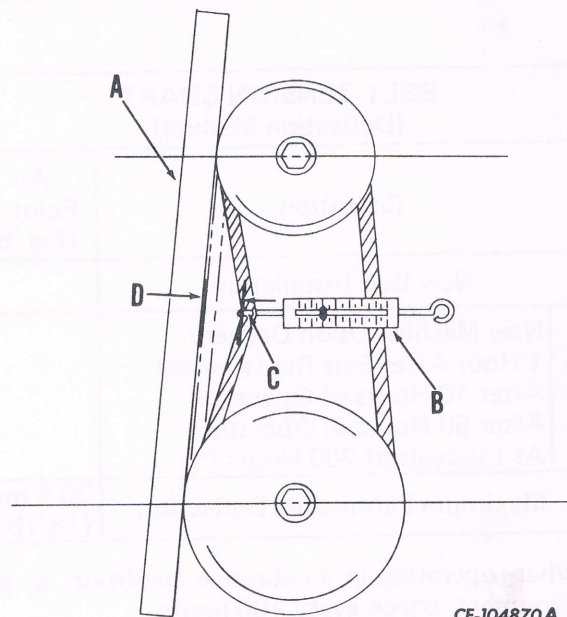
Gates Rubber Company
999 South Broadway
Denver, Colorado 80217

The required belt tensions are shown in the "BELT TENSION CHART." It is preferred that tension be checked at the mid-point of the longest span (Fig. 5).

NOTE: Do not allow belt tensions to fall below the specified "Minimum Permissible Tension" values. Check the belt tension more often if necessary. Do not retension belts to tensions higher than the "Retension" values shown in the chart.

In emergency cases only when a Gates belt tension gauge is not available and the machine must be operated, belt tensions may be checked by "Deflection Method." Refer to Fig. 4.

NOTE: Do not allow belt deflections to exceed the "Maximum Permissible Deflection" values. If necessary, check belt tension more often. Do not retension the used belts to deflections less than the "Retension" values.



CE-104870A

Fig. 4. Deflection Method

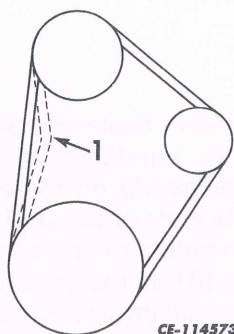
The use of "Fishhook Scale and Straight Edge" is preferred over the unreliable "Thumb Method." Place a straight edge (A) on top of the belt being checked with the ends of the straightedge extending beyond the centers of the two pulleys. Place a pull-type scale (B) at the tension point (C, Fig. 4) and pull the belt inward toward the opposite side of the belt. With a tension of 2 N•m (25 lbs) indicated on the scale, measure the distance (D) between the straightedge and the outside edge of the belt. Adjust the belts to the correct tension. The required belt deflections under 2 N•m (25 lbs) deflecting force are shown in the following charts.

MAINTENANCE

BELT TENSION CHART (Using "KRIKIT" Gauge)		
Condition		
New Belt Installation		533.79N (120 lbs)
Retention	New Machine Upon Delivery	400.34N (90 lbs)
	1 Hour After Belt Replacement	
	After 10 Hours of Operation	
	After 50 Hours of Operation At Intervals of 200 Hours (*)	
Minimum Permissible Tension		266.89N (60 lbs)

BELT TENSION CHART (Deflection Method)		
Condition		At Point 1 (Fig. 5)
New Belt Installation		
Retention	New Machine Upon Delivery	20.6 mm (13/16")
	1 Hour After Belt Replacement	
	After 10 Hours of Operation	
	After 50 Hours of Operation At Intervals of 200 Hours (*)	
Maximum Permissible Deflection		

*When operating in an abrasive condition, or environment, check every 100 hours.



CE-114573

Fig. 5. Belt tension Check Point

Using "Gates KRIKIT Gauge" (Fig. 6)

1. There are several ways to hold the gauge while testing belt tension.

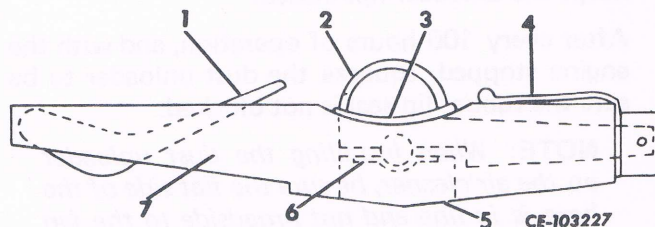
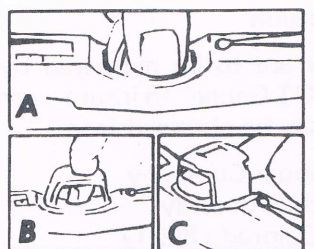


Fig. 6. Gates KRIKIT Gauge

1. Indicator Arm
2. Rubber Finger Loop
3. Pressure Pad
4. Pocket Clip
5. Positioning Flange
6. Tension Spring
7. Body

- a. By holding the rubber loop (2) with the ends of the thumb and index fingers directly on the raised pressure pad (3). (A, Fig. 7)
- b. By inserting the index finger through top of the rubber loop (2). (B, Fig. 7)
- c. By slipping the index finger between the rubber loop (2) and pressure pad (3). (C, Fig. 7)

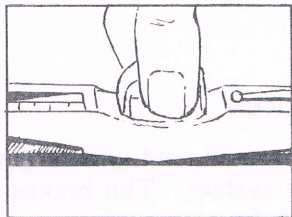


CE-103228 A

Fig. 7. Holding the Gauge

NOTE: *DO NOT touch the gauge with any other finger while testing the belt, as this will cause the gauge to read inaccurately.*

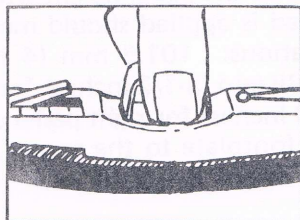
2. Position the gauge in the center of the belt between the two pulleys. The flange (5) should be flat against the top edge of the belt (Fig. 8). Make sure the indicator arm (1) is below the scale on top of the body (7).



CE-103229

Fig. 8. Positioning the Gauge

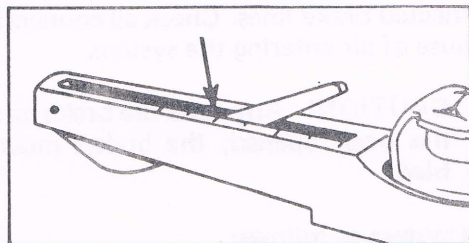
3. Very slowly press on the pressure pad (3) at a right angle to the belt surface until you hear or feel the click release of the tension spring (6). **DO NOT PRESS ANY MORE** as soon as the spring clicks and the indicator arm (1) shows the correct reading (Fig. 9).



CE-103230

Fig. 9. Pressing for Reading

4. The correct tension reading is read at the point where the top of the indicator arm crosses the numbered scale on the top of the gauge body, as shown in Fig. 10.



CE-103231

Fig. 10. Reading Belt Tension Gauge

NOTE: Before adjusting belt tension, check the tension several times. Use an average of the readings.

ADJUSTMENT

Alternator Belt (Fig. 11)

1. Loosen the alternator adjusting brace bolt (1) and the alternator mounting bolt (2).

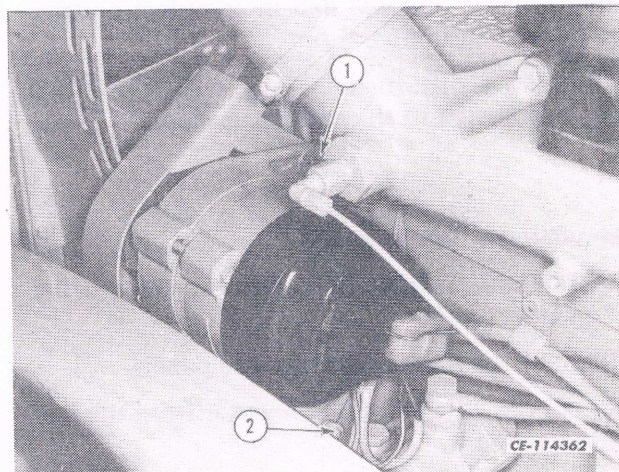


Fig. 11. Alternator Belt Adjusting Points

1. Adjusting Brace Bolt
2. Mounting Bolt

2. Move the alternator out to tighten the belts or in to loosen them until the correct tension is obtained as described under "TENSION."

3. Retighten the bolts (1 and 2). Refer to "SPECIAL TORQUES" in Section 9.

NOTE: Excess belt tension will damage the alternator bearings. If a pry bar is used, **DO NOT OVER TENSION.**

REMOVAL AND REPLACEMENT

Replace badly worn, severely cracked or oil (or grease) soaked belts immediately.

Do not use belt dressing on belts.

Prior to installing the new belt, inspect all pulley grooves for wear and the presence of grease, oil, dirt, etc. If foreign material is present, it should

be removed. If a pulley is damaged or grooves worn, it should be replaced. When replacing belts and pulleys, pulley alignment must be checked under belt tensioned conditions (brackets securely clamped). A misalignment that can be detected by the naked eye is detrimental.

All pulley supporting bearings, shafts and brackets, etc. must be in working order.

During assembly, do not force the belt into the pulley grooves by prying with a screw driver, pry bar, etc. This will damage the belt side cords which will cause the belt to turn over in the pulley grooves and will end in complete destruction of the belt in operation.

If the belt is disturbed for any reason, the belt must be adjusted to the correct tension.

Removing the Belt (Fig. 11)

1. VERTICAL EXHAUST: Remove the muffler and exhaust pipe.
2. Remove the hood and front side panels.
3. Disconnect the harness connector from the rear of the alternator.
4. Support the alternator and remove the mounting hardware (1 and 2).
5. Separate the pulley shield from the alternator and slip the belt off the pulley.
6. Put the alternator and shield in a place where it can not fall off and be damaged.
7. Slip the belt off the water pump and crankshaft pulley. Work the belt over the fan blades and remove it through the top opening of the radiator shroud.

Installing New Belt

1. Work the belt over the fan blades. Install the belt in the water pump and crankshaft pulley grooves.
2. Support the alternator, place belt in the pulley groove, install the shield and the alternator mounting hardware (1 and 2, Fig. 11).
3. Adjust the belt as shown under "ADJUSTMENT" and secure the mounting hardware. Refer to "SPECIAL TORQUES" in Section 9.

4. Install the harness connector and retainer to the alternator.

NOTE: *Do not scrape or twist belt while installing over fan blades as this will damage belt and shorten its life.*

BRAKES

SERVICE BRAKES

This machine is equipped with a hydraulic wet disc-type brake system. The brakes are located inside of the rear frame.

Brake Pedal Adjustment (Fig. 12)

Each brake pedal has incorporated a special eccentric adjusting bolt (1 and 3), for setting brake pedal free height. These bolts work in conjunction with the equalizer valve assembly. Loosen lock nuts (2) and rotate eccentric bolts (1) to obtain 152 mm (6-inches) (A) brake pedal free height from the top of the brake pedal (7) to the platform (4).

Final inspection of the pedal height when a 45 kg (100 pound) load is applied should meet the following specifications: 101.6 mm (4 inches) for latched pedals, 89 mm (3-1/2 inches) for left pedal and 76.2 mm (3 inches) for right pedal when measured from the footplate to the top of the pedal pad.

Bleeding the Brakes



CAUTION! Air trapped in the hydraulic brake system reduces braking effectiveness.

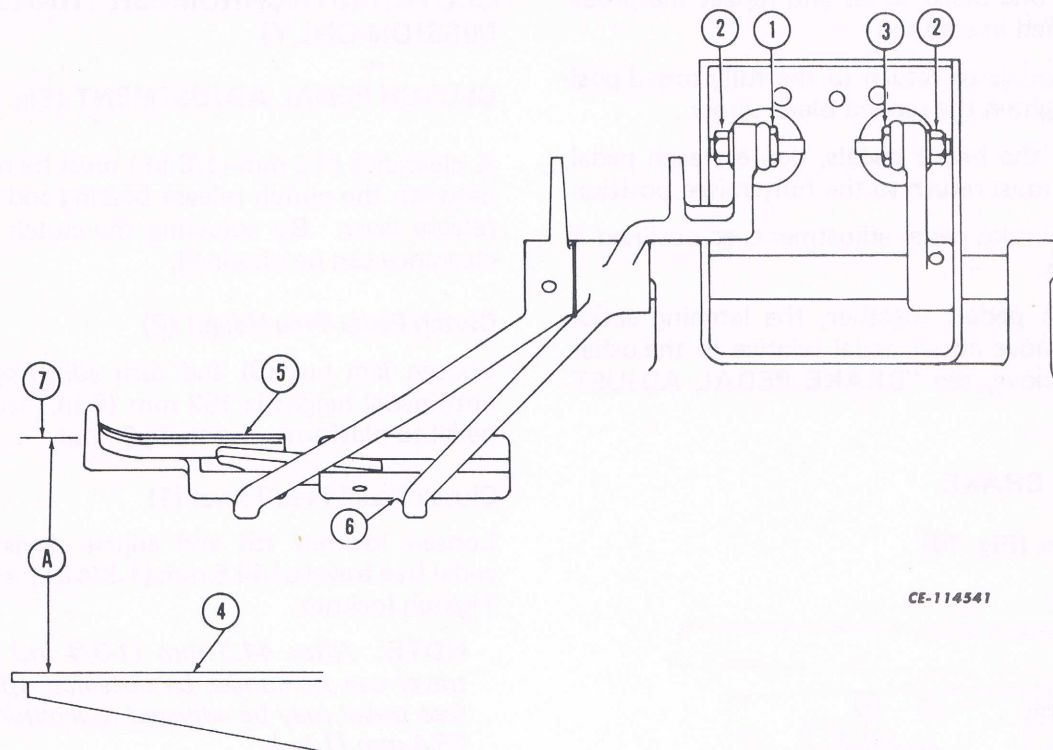
Air in the brake system will cause a loss of braking power. When this condition occurs, the air must be bled. Air is most likely to enter at system leaks or disconnected brake lines. Check all connections for the cause of air entering the system.



CAUTION! Any time the brake circuit has been opened, the brakes must be bled.

Bleed the system as follows:

1. Park the machine and apply the parking brake. Lower the loader or any mounted equipment (if equipped) to the ground. Block the wheels.



CE-114541

Fig. 12. Brake Pedal Adjustment

- | | |
|-----------------------------|------------------------|
| 1. Eccentric Adjusting Bolt | 5. Right Brake Pedal |
| 2. Lock Nuts | 6. Left Brake Pedal |
| 3. Eccentric Adjusting Bolt | 7. Top of Brake Pedals |
| 4. Platform | |

2. Run the machine for approximately one-half minute to ensure that the brake reservoir and lines are full of oil. Keep engine running as brakes are bled.

3. Clamp the brake dump hose to prevent oil from returning to transmission.

4. Attach clear plastic tubes (PLT-700-5), to both bleed screws (1, Fig. 13) and insert the open ends into the hydraulic fluid filter hole (2).

5. Loosen bleed screws with the machine running until oil is flowing through plastic tubes.



CAUTION! Be careful not to splash hydraulic oil into eyes.

6. Depress latched pedals rapidly but release them slowly three or four times. Repeat this until oil flowing through plastic tubes is free of air.

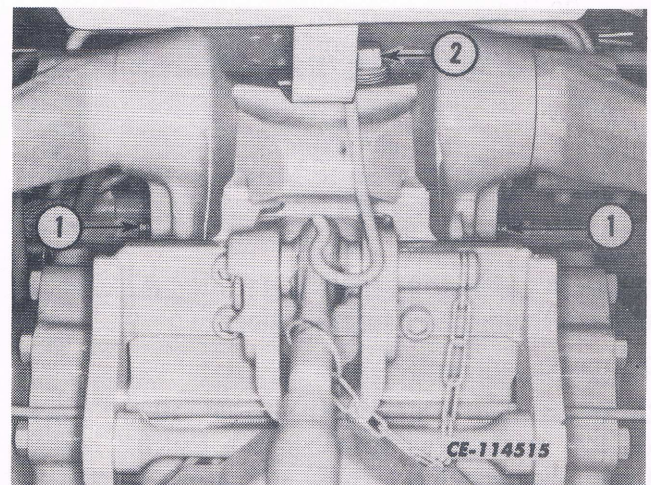


Fig. 13. Brake Bleeder Screws

- | |
|--------------------------------|
| 1. Brake Bleeder Screws |
| 2. Hydraulic Fluid Filter Hole |

7. Tighten one bleed screw and repeat the procedure outlined in step six.

8. Allow pedals to return to the fully raised position and tighten the second bleed screw.

9. Unlatch the brake pedals, depress each pedal, each pedal must return to the fully raised position.

10. Check brake pedal adjustment, as outlined in this section.

11. Relatch pedals together, the latching action must not move either pedal relative to the other. If pedals move, see "BRAKE PEDAL ADJUSTMENT."

PARKING BRAKE

Adjustment (Fig. 14)

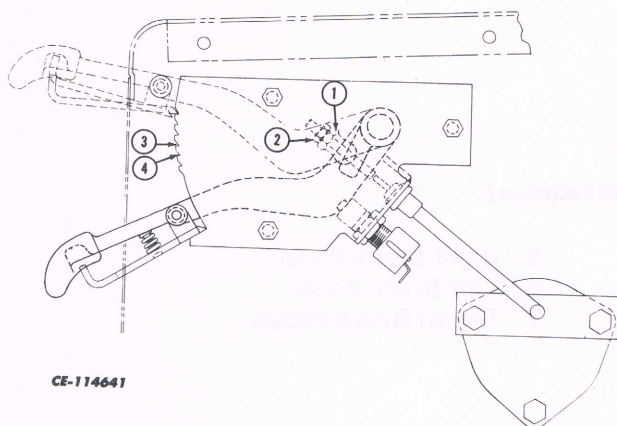


Fig. 14. Parking Brake Adjustment

1. Pivot Nut
2. Jam Nut
3. Fourth Notch
4. Fifth Notch

1. Install blocking in front and behind the wheels to keep the machine from moving.

2. Loosen jam nut (2).

3. Adjust pivot nut (1) until a 311N (70 lbf) \pm 9N (2 lbf) is required to move the parking brake handle between the fifth (4) and fourth (3) notch.

4. Retighten the jam nut (2).

CLUTCH (SYNCHROMESH TRANSMISSION ONLY)

CLUTCH PEDAL ADJUSTMENT (Fig. 15)

A clearance of 3 mm (1/8 in.) must be maintained between the clutch release bearing and the clutch release lever. By adjusting the clutch pedal this clearance can be obtained.

Clutch Pedal Free Height (2)

Loosen jam nut (3) and turn adjusting bolt (4) until pedal height is 152 mm (6 in.) from top of pedal to platform. Tighten jam nut.

Clutch Pedal Free Travel (1)

Loosen locknut (5) and adjust clevis (6) until pedal free travel of 44.5 mm (1-3/4 in.) is obtained. Tighten locknut.

NOTE: After 44.5 mm (1-3/4 in.) of free travel can no longer be obtained, the pedal free travel may be adjusted to a minimum of 25.4 mm (1 in.).

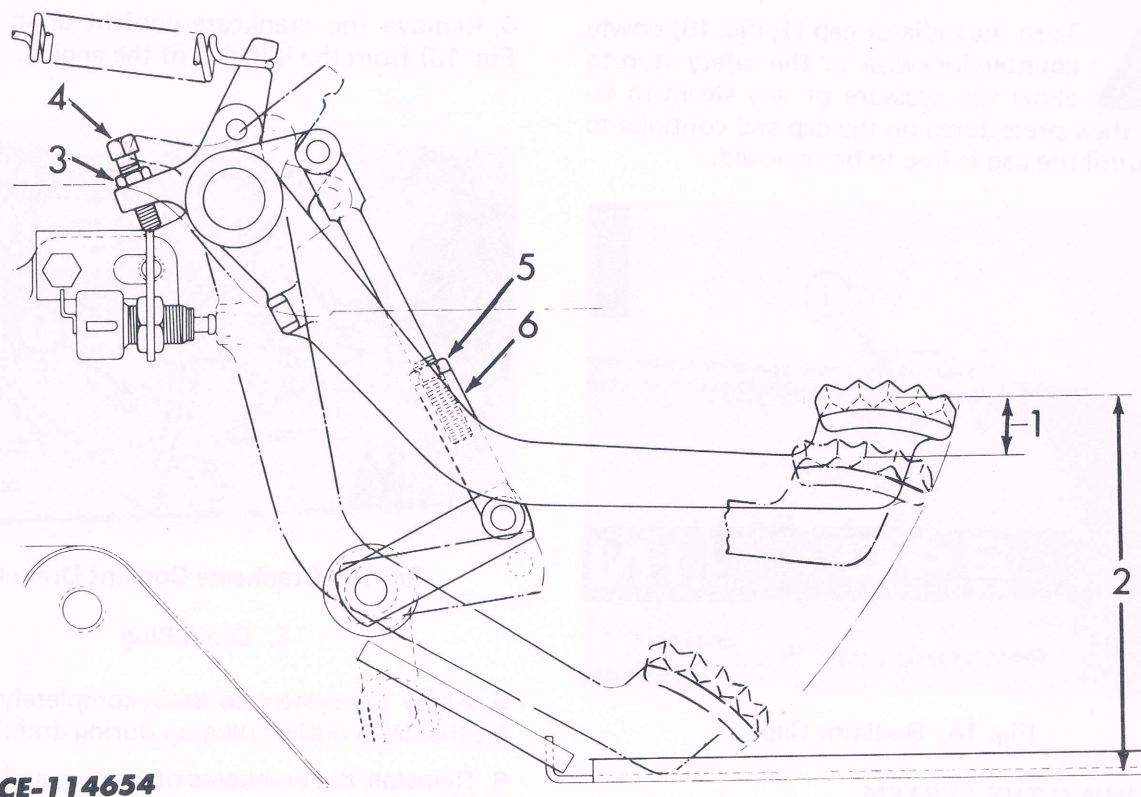
COOLING SYSTEM

GENERAL

The cooling system operates under pressure which is controlled by the pressure relief valve in the radiator cap.

Circulation is controlled by a thermostat which bypasses coolant flow from the radiator until the engine reaches operating temperature.

The pressure-cooled system will not operate properly unless the cooling system is tight. The radiator cap must be properly tightened to the stop. The gasket surface of the cap must be in good condition. The radiator cap regulating valve and the thermostat must operate properly. The system must not have loose connections or leaks. Unless these instructions are followed, pressure will not be maintained and loss of coolant and consequent overheating will result.



CE-114654

Fig. 15. Clutch Pedal Adjustment

- | | |
|-----------------------------|-------------------|
| 1. Clutch Pedal Free Travel | 4. Adjusting Bolt |
| 2. Clutch Pedal Free Height | 5. Lock Nut |
| 3. Jam Nut | 6. Clevis |

CARE OF THE SYSTEM

To keep the system internally free of rust and sludge, add I.H. cooling system conditioner (refer to "COOLING CONDITIONERS") to the water during warm weather operation or I.H. anti-freeze (refer to "ANTI-FREEZE") during cold weather operation.

Twice a year (spring and fall) or more often, depending upon the mineral content of the water used, the cooling system should be drained and thoroughly flushed. This is particularly important before using an anti-freeze solution. The appearance of rust or sludge in the system indicates the rust and sludge inhibitor additives are weakened and must be replaced. Refer to "CLEANING THE SYSTEM" in this section.

RADIATOR CAP (Fig. 16)

A regulating vacuum/pressure valve, built into the radiator cap, is designed to open at a pressure of approximately 63.7 to 75.8kPa (9.2 to 11 psi).

NOTE: Do not attempt to repair or replace any of the regulating valve parts. If the valve is faulty, replace it with a new radiator cap of the same type.

Removal



CAUTION! When checking the cooling system on a machine that has been running. Loosen the radiator cap slowly to release any pressure that could have accumulated, and to prevent injury from overflowing hot fluids.

MAINTENANCE



Turn the radiator cap (1, Fig. 16) slowly counterclockwise to the safety stop to allow the pressure or any steam to escape; then press down on the cap and continue to turn until the cap is free to be removed.

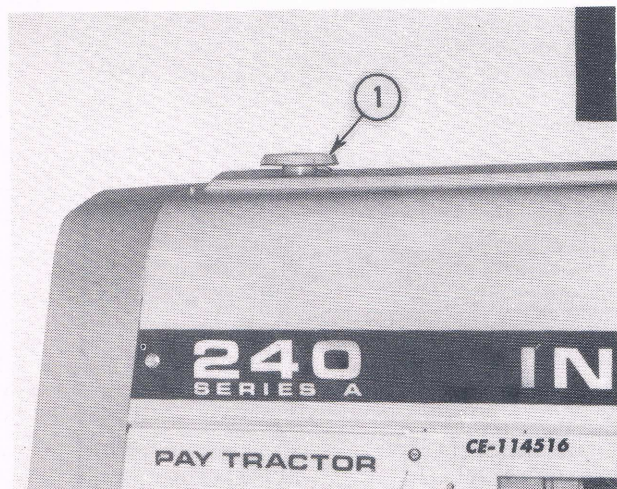


Fig. 16. Radiator Cap

DRAINING THE SYSTEM

1. Run the engine until the coolant temperature gauge is in the normal operating range, then shut the engine down.
2. Remove the radiator cap. Use CAUTION. Refer to "RADIATOR CAP" in this section.
3. Open the radiator drain valve (1, Fig. 17).

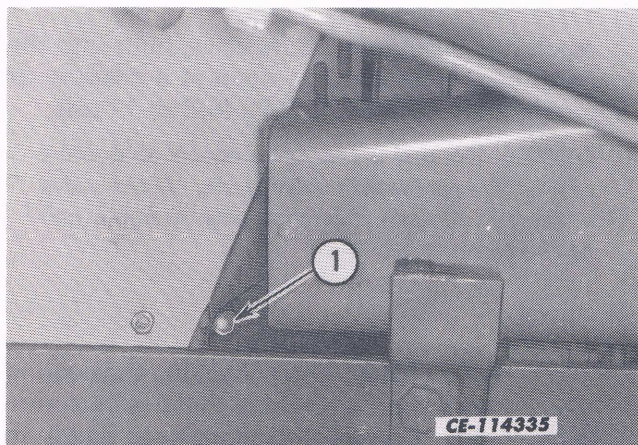


Fig. 17. Radiator Drain Valve

1. Drain Valve

4. Remove the crankcase coolant drain plug (1, Fig. 18) from the left side of the engine.

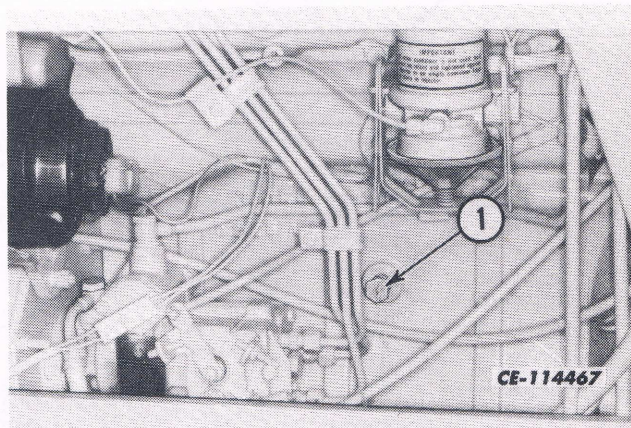


Fig. 18. Crankcase Coolant Drain Plug

1. Drain Plug

5. Allow the system to drain completely. Do not let the drain outlets plug up during draining.
6. Reinstall the crankcase drain plug and close the radiator drain valve.

FILLING THE SYSTEM

Do not add coolant into the radiator of an overheated engine unless absolutely necessary. However, if necessary:

Remove the radiator cap carefully, refer to "RADIATOR CAP" in this section.

NOTE: Fill the cooling system with the engine running at low idle. This allows more air to escape and the system to be filled to maximum capacity. Install "IH cooling system conditioner" (for warm weather operation) or "IH anti-freeze" (for cold weather — consistently at or below 0° C (+32° F) according to the instructions printed on the container. Refer to "ANTI-FREEZE" in this section.

NOTE: Use only a corrosion inhibitor that is compatible with aluminum. DO NOT use inhibitor labeled as "acid neutralizers."

1. Be sure the drains are closed.
2. Fill the cooling system until the coolant is 38 mm (1-1/2-inches) above the radiator core. Wait

a few minutes to allow for the escape of air; then add coolant as needed.

3. Install the radiator cap.

NOTE: *Before replacing the filler cap, be sure to remove any chaff or dirt particles which may be on the gasket surface or cap.*

4. Apply the parking brake.

5. Start and run the engine until the normal operating temperature is reached.

6. Stop the engine, carefully remove the radiator cap. Refer to "RADIATOR CAP" in this section.

7. Recheck the level. If necessary, add coolant.

8. After all air is removed and level remains fixed, install the radiator cap.

NOTE: *A pressure-cooled system will not operate properly unless the system is sealed.*

CHECKING THE COOLANT LEVEL

Prior to starting the engine at the beginning of the day, check the coolant level in the radiator.

Remove the radiator cap and check the level. The correct level is 38 mm (1-1/2-inches) above the radiator core. If necessary, add clean coolant. Refer to "FILLING THE SYSTEM."

If the water temperature gauge indicates overheating, stop the engine and check the coolant level. Use caution when removing the radiator cap. Refer to "RADIATOR CAP" and "FILLING THE SYSTEM."

CLEANING THE SYSTEM

1. Drain the system. Refer to "DRAINING THE SYSTEM" in this section.

2. Close the radiator and engine drains.

3. Fill the system with clean water (refer to "FILLING THE SYSTEM") and add IH Cooling System Cleaner or other compound that is compatible with aluminum. Flush the system in accordance with the instructions furnished with the compound.

4. After flushing, rinsing, and completely draining the system, refill with clean coolant. Refer to "FILLING THE SYSTEM."

ANTI-FREEZE

1. I.H. anti-freeze and coolant is recommended. This product, specifically formulated for I.H. equipment, contains all necessary and proper inhibitors and has been thoroughly evaluated for optimum effectiveness.

NOTE: *DO NOT use methanol and alcohol as anti-freeze.*

2. I.H. anti-freeze and coolant is compatible with both chromate and non-chromate corrosion resisters.

3. DO NOT use anti-freeze year-round in areas where ambient temperatures exceed 38°C (100°F). Seasonal changes are recommended to replace inhibitors which become exhausted and to flush out the system. When inhibitors become depleted, the anti-freeze becomes corrosive and attacks and coats the metallic surfaces of the cooling system, thus reducing heat transfer.

The boiling point of ethylene glycol anti-freeze solutions is higher than plain water, but their ability to transfer heat is less. In hot weather, this difference will result in coolant temperature running hotter than with water, and where oil-to-water coolers are used, the transmission oil temperatures will run hotter.

4. DO NOT use anti-freeze containing sealer or anti-leak additives. These additives may cause plugging problems throughout various areas of the cooling system and will restrict coolant flow.

The following table shows the percentage of anti-freeze solution required for the various temperatures.

Approximate Freezing Point		USE IN COOLING SYSTEM IH Premium (Ethylene Glycol-Permanent Type)
°F	°C	
+20°	- 7°	16%
+10°	-12°	25%
0°	-18°	33-1/3%
-10°	-23°	40%
-20°	-29°	45%
-30°	-34°	50%
-40°	-40°	54%
-50°	-46°	58%
-60°	-51°	62%
-70°	-57°	65%

NOTE: *A further increase in anti-freeze volume decreases the freezing point.*

5. A minimum volume of 30% anti-freeze is required to provide suitable corrosion protection. A concentration greater than 68% will adversely affect freeze protection and heat transfer rates.

Check the solution frequently and at normal operating temperature, to be sure the cooling system has sufficient protection against freezing.

COOLING CONDITIONERS

1. All inhibitors become depleted through normal operation and additional cooling conditioner must be added to the coolant every 500-1000 hours of engine operation at the rate of 0.5 l for each 30 l (8 gls) of cooling capacity.

2. I.H. Cooling System Conditioner is a complete inhibitor system, of a non-chromate type, which provides corrosion protection. PH control for maintaining an acid-free coolant, and water softening to prevent the formation of mineral deposits. It is suitable for use in all systems being compatible with both water and anti-freeze solutions.

3. DO NOT use soluble oil as a corrosion inhibitor.

4. DO NOT use additives or solutions that claim to improve heat transfer and prevent engine overheating. Tests indicate that none perform as claimed; in fact, some may do severe damage. There are no miracle additives that will increase heat transfer; conditioned water is still the best coolant.

WATER

Use clean water inhibited with I.H. Cooling System Conditioner to minimize corrosion and scale deposits and to counteract alkaline, acid or saline water.

Preventive Maintenance

The best way to avoid overheating problems is through preventive maintenance; keeping the components in top operating condition. This includes keeping the inside as well as the outside of the engine and radiator clean and:

1. Thoroughly flush the system with water before installing anti-freeze or cooling conditioner. If the system has been permitted to become rusty or dirty, use I.H. Cooling System Cleaner and Neutralizer No. 995007R1 carefully following cleaning recommendations on container.

2. For winter rust prevention, a fresh filling of I.H. anti-freeze is recommended. In the spring, drain and discard the old anti-freeze solution, as the rust inhibitor may be exhausted from contamination and continued use.

3. During warm weather, it is necessary that I.H. Cooling Conditioner be added to the coolant (water) to protect the cooling system after draining the anti-freeze. This inhibitor solution should be drained and discarded in the fall before installing anti-freeze.

CLEANING THE RADIATOR AND OIL COOLER

Minor internal sludge accumulations will be removed when flushing the cooling system.

When internal accumulations are found that cannot be removed by normal flushing methods, consult your authorized International PAY LINE distributor.

Remove all bugs or dirt from the radiator core and oil cooler core using air or water under pressure. Direct the flow through the core, opposite the normal direction of air flow.

Straighten bent fins, being careful not to injure the tubes or break the bond between the fins and tubes. The oil cooler can be swung out for easier cleaning.

THERMOSTAT

The thermostat has two functions; gain rapid engine warm-up; control coolant temperature. The thermostat is the nonadjustable type.

Engine overheating is sometimes due to a faulty thermostat. Remove and check the thermostat as follows:

Removal

1. Drain the cooling system to a level below the thermostat housing. Refer to "DRAINING THE SYSTEM" in this section.

2. Disconnect radiator hose from the water outlet flange.

3. Remove the hardware securing water outlet flange to the cylinder head; remove flange, thermostat and gasket.

Checking (Fig. 19)

1. Clean the thermostat. Replace the thermostat if coated with scale as this will not allow proper operation.

2. Check the thermostat as follows:

a. Suspend the thermostat and a thermometer in a container of water.

NOTE: *Do not allow either the thermostat or thermometer to contact the container sides or bottom.*

b. Heat water and carefully note temperature when thermostat starts to open (approx. 80°C (176°F)) and when fully open (approx. 84°C (183°F)).

c. If thermostat does not function as described, replace it.

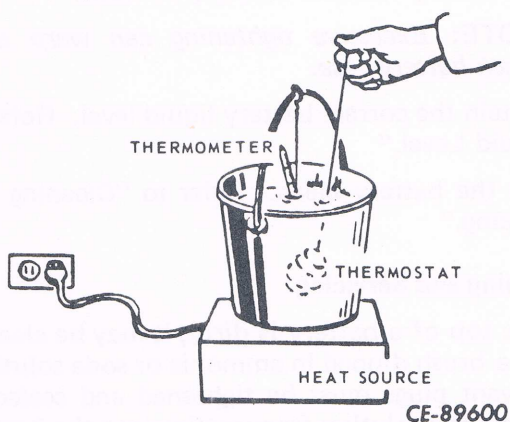


Fig. 19. Checking the Thermostat

Installation

1. Clean the gasket surfaces of the cylinder head and the thermostat housing to assure proper sealing when reassembled.

2. Install the thermostat in the cylinder head.

3. Install and secure water outlet flange onto the cylinder head using a new gasket. Tighten the two cap screws.

4. Reconnect and secure the radiator hose.

5. Fill the cooling system, refer to "FILLING THE SYSTEM."

WATER PUMP

No lubrication of the pump is required as the bearings are of the permanently sealed type and are packed with special lubricant at the factory for the life of the bearing.

The water pump requires no attention other than bearing replacement when they show excessive looseness or if a water leak develops which indicates that a damaged or badly worn seal needs replacement.

ELECTRICAL SYSTEM

PRECAUTIONS



CAUTION! Before working on any part of the electrical system, disconnect the battery ground strap from the battery terminal. Do not reconnect it until all electrical work has been completed.

The electrical generating system now incorporates a direct diode rectified generator (alternator w/ integral regulator) which requires special handling and procedures different from those associated with the old style DC generator.

In order to assure satisfactory operation of the electrical system, a periodic check should be made of the following:

Connections at the solenoid switch should be kept clean and tight.

Battery cable terminals should be kept clean and tight.

Battery terminal post should be kept clean and the electrolyte at the proper level.

Repair or replace all broken wires immediately. All terminals must be clean and securely fastened; never paint connections.

ALTERNATOR W/INTEGRAL REGULATOR

The alternator incorporates a built in transistorized voltage regulator. The alternator requires no lubrication since its bearings are factory lubricated for life and require attention only at time of major overhaul. The integral regulator is sealed by the manufacturer and cannot be adjusted.

MAINTENANCE

NOTE: *The unit electrical system is negative ground. Be CERTAIN the ground polarity is correct when:*

- a. *Installing a new battery.*
- b. *Connecting a battery charger.*
- c. *Using a booster.*

Failure to observe proper polarity will result in damage to the alternator.

NEVER use fast charger as a booster to start the engine.

NEVER unhook a battery terminal while the engine is running.


NEVER disconnect the alternator cable while the engine is running.

DO NOT POLARIZE THE ALTERNATOR.

DO NOT SHORT ACROSS OR GROUND ANY TERMINALS OF THE ALTERNATOR OR REGULATOR.

STORAGE BATTERY (Fig. 20)

The machine is equipped with one 12 volt battery. It is located under the hood rear cover.

 **CAUTION!** Electrical storage batteries give off highly inflammable hydrogen gas when charging and continue to do so for some time after receiving a steady charge. Do not under any circumstances allow an electric spark or an open flame near the battery. Do not lay tools across battery terminals as this may result in a spark or short circuit which may cause an explosion. Be careful to avoid spilling any electrolyte on hands or clothing.

Never allow the battery to stand on concrete, ground or a metal support unless proper insulation is provided. A wooden platform or board is sufficient insulation. Be sure the battery is fastened securely to avoid damage from vibration.

Maintenance

Proper battery maintenance will assure maximum service. Following are a few simple rules:

Keep battery cable terminals clean and tight.

Keep filler cap vent holes unplugged.

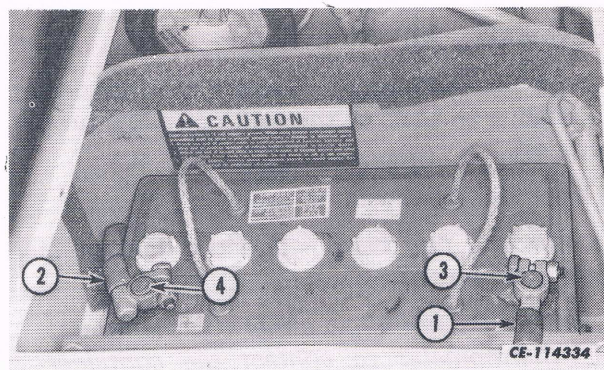


Fig. 20. Battery Connections

1. Battery to Ground Cable
2. Battery to Solenoid Switch Cable
3. Battery Negative Terminal
4. Battery Positive Terminal

Replace worn, cracked, broken or corroded cables.

Keep battery fastened securely in frame.

NOTE: *Excessive tightening can warp or crack battery case.*

Maintain the correct battery liquid level. Refer to "Liquid Level."

Keep the battery clean. Refer to "Cleaning and Servicing."

Cleaning and Servicing

If the top of a battery is dirty, it may be cleaned with a brush dipped in ammonia or soda solution. The vent plugs must be tightened and sealed to prevent any solution from getting into the battery cells. After the foaming stops, flush off the battery with clean water and unseal the vent plugs. Brighten the terminal contact surfaces with steel wool or a stiff brush.

Periodically disconnect the battery cables and clean the terminals and battery posts with a wire brush. Always disconnect the ground cable first and reconnect it last.

After the cables have been reconnected, coat the post and terminals with resin flux, vaseline or chassis grease.

Liquid Level

The electrolyte in each cell must be at the proper level (6.3 to 12.7 mm (1/4 to 1/2 inch above the plates)) at all times to prevent battery failure. Most

batteries have a water level fill guide mark and this should be followed for proper level indication. Check the level of the electrolyte. When the electrolyte is below this level pure distilled water must be added. Never use hydrant water or any water which has been in a metal container. Acid or electrolyte must never be added except by a skilled batteryman. Under no circumstances, add any special battery "dopes," solutions or powders.

Cold Weather Operation

It is especially important to keep the battery at full charge for cold weather operation. Add distilled water to the battery during freezing temperatures only when the engine is to operate for several hours, to thoroughly mix the water and the electrolyte, or damage to the battery will result from the water freezing.

A battery three-fourths charged is in no danger from freezing. Therefore keep the battery better than three-fourths charged, especially during winter weather.

If your machine is not to be operated for some time during the winter months, it is advisable to remove the battery and store in in a cool, dry place above freezing 0°C (+32°F). Place the battery on a rack or bench.

NOTE: *A battery that is in a low state of charge or with high resistance connections will cause the cranking motor to operate at a lower speed and will affect starting of the engine.*

Connecting Booster Batteries

When required, a booster 12-volt battery may be connected in parallel with the 12-volt system on the machine.

NOTE: *All circuits must be turned Off. The electrical system is negative (—) grounded. Reversed polarity will result in permanent damage to components of the electrical system.*

CRANKING MOTOR

The cranking motor must be lubricated every 5000 hours under normal starting conditions, or sooner, should it become necessary to remove the motor in the process of engine servicing. If the application is such that frequent or severe engine starts

are required, motor lubrication and maintenance must be made at shorter intervals of 1000 hours or less.

1. Remove the cranking motor for lubrication.
2. At time of lubrication, motor should be cleaned, disassembled and inspected for further maintenance requirements. consult your PAY LINE distributor for servicing procedure.
3. All wicks and oil reservoirs must be saturated with Grade-10 engine oil. The splines underneath the clutch should be lightly lubricated with the same oil.
4. Reinstall the cranking motor.

If the cranking motor fails to operate properly, consult your authorized PAY LINE distributor.

BULB REPLACEMENT

Refer to the following procedures for bulb replacement.

Front Driving Lights

Raise the rubber retainer lip; remove the sealed beam unit. Disconnect the plug from the sealed beam.

The headlights on the tractor are mounted in cup shaped housings in the fenders and can be adjusted to various positions by loosening the mounting screws at the headlight housings. Tighten the screws securely when the desired position is obtained.

Instrument Panel Lights, Parking Brake Warning Light and Transmission Oil Temperature Warning Light (Hydrostatic Transmission Only)

Remove the hood access cover. Reach behind the instrument panel and pull the socket free. Depress the bulb, turn it counterclockwise in the socket and pull free of the socket.

Engine Oil Temperature Warning Light and Alternator Warning Light

Unscrew the lens. Depress the bulb, turn it counterclockwise in the socket and pull free of socket.

Tachometer and Speedometer (If equipped) Lights

Reach under side panel next to gauge and pull light socket free of gauge. Pull bulb free of socket.

Flashing Warning Lights

Turn the lens counterclockwise and remove. Depress the bulb, turn it counterclockwise in the socket and pull it free of socket.

Stop and Tail Lights

Remove the screws securing the lens. Depress the bulb, turn it counterclockwise in the socket, then pull it free of socket.

Rear Work Light

Remove the rubber retainer lip; remove the sealed beam unit. Disconnect the clip from the sealed beam.

FUSE REPLACEMENT

Two cartridge-type 50 ampere fuses are located in the fuse housing. If a short circuit occurs in the lighting circuit, the fuse will burn out and break the circuit, preventing damage to the electrical system.

It is important to use the same capacity fuse for replacement. If the lights fail, check the fuse. If the fuse continually burns out, check the electrical wiring for short circuits.

To install a new fuse, pull out the old fuse and replace it with a new one.

ENGINE

WARRANTY NOTICE

The International Harvester warranty on this engine and components shall not apply to any failure that results from an unauthorized adjustment of the fuel injection system. (Refer to Injection Pump in "FUEL SYSTEM.")

CHECKING THE CRANKCASE OIL (Fig. 21)



CAUTION! Stop the engine before removing the gauge. Do not check the oil level while the engine is running.

Before checking the crankcase oil level, allow enough time for the oil to drain back into the crankcase to provide an accurate reading.

EXHAUST SMOKE TABLE

Smoke Number		Color	Explanation
Acceptable Range	0	Clear	No smoke visible, only heat distortion or objects seen through exhaust gas vapor.
	1	Trace	Very faint smoke.
	2	Light Gray	Definite smoke visible.
	3	Dark Gray Haze	Usual maximum considered desirable for continuous operation.
4*		Black	Not desirable for continuous operation.
5*		Heavy Black	Soot color — possible flame or glow present, depending on the length of the exhaust line.

*If this smoke is encountered, stop the engine and investigate the cause.

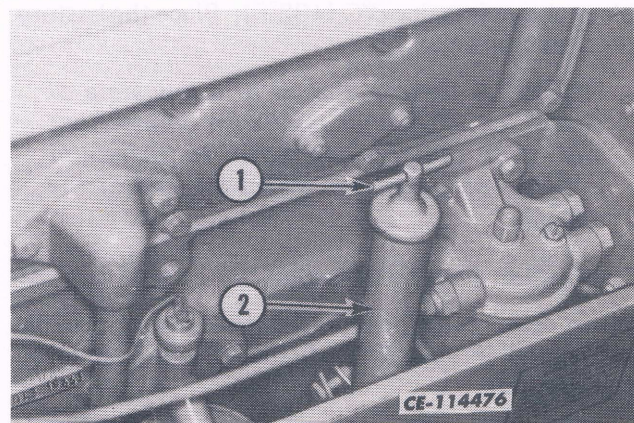


Fig. 21. Engine Oil Level Gauge and Filler Tube

1. Engine Oil Level Gauge
2. Filler Tube

1. Loosen the "T" handle of the gauge (1), remove the gauge and wipe it clean.
2. Insert the gauge completely in, but do not tighten.
3. Remove the gauge and check the oil level. If level is at or below the ADD mark add oil to bring the level up to the "FULL" mark.

4. Install and secure the oil level gauge.

NOTE: *Never run the engine if the level of the oil is above the FULL mark or at or below the ADD mark on the level gauge.*

CHANGING THE CRANKCASE OIL

Remove the crankcase drain plug (2, Fig. 22) and drain all the oil from the crankcase while the engine is warm. Reinstall the plug, change the oil filter and refill with new oil. Refer to "LUBRICANT SPECIFICATIONS AND CAPACITIES" in Section 7.

CHANGING THE LUBRICATING OIL FILTER ELEMENT

The spin-on type filter (1, Fig. 22) can not be cleaned and should not be disturbed except when it becomes necessary to replace it.

Removal

1. After reaching operating temperature, stop the engine and drain the crankcase. Refer to "CHANGING THE CRANKCASE OIL."
2. Clean the outside of the filter to prevent dirt from entering the system while servicing.
3. Remove the spin-on filter by turning it counter-clockwise. Discard the filter.

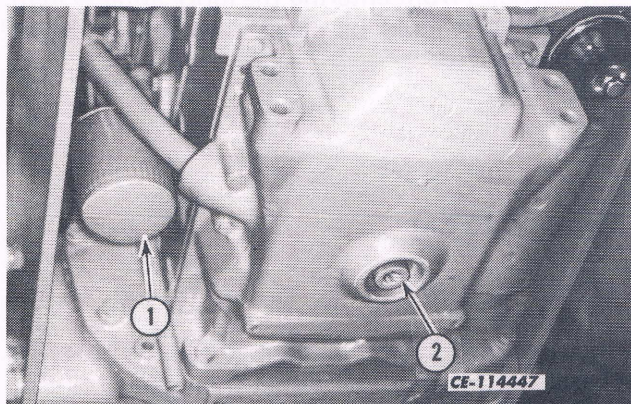


Fig. 22. Oil Change Service Points

1. Spin-On Oil Filter
2. Crankcase Drain Plug

Installation

1. Install a new filter by applying a little new engine oil to the seal and thread the filter on by hand by turning it clockwise until hand tight. Do not use tools to tighten the filters.
2. Reinstall and tighten the crankcase drain plug.
3. Fill the crankcase with fresh oil. Refer to the "LUBRICANT SPECIFICATIONS AND CAPACITIES CHART" in Section 7 for quantity and grade of oil specified.
4. Operate the engine at low idle for 5 to 10 minutes, do not operate under load until normal oil pressure and temperature are reached. During warm-up check the filter and drain plug for leaks.

ENGINE VALVES

Clearance Adjustment



CAUTION! Do not adjust valves with the engine running.

BE ACCURATE. USE A FEELER GAUGE WHEN ADJUSTING THE VALVE CLEARANCE.

Disassembly



CAUTION! Be sure that all hydraulic operated equipment is blocked up or lowered to the ground.

1. Remove the muffler and exhaust pipe extension (vertical exhaust only).
2. Remove the hood and side panels.
3. Remove the valve cover and gasket. Turn the crankshaft until the number one piston is on the compression stroke and the timing pointer on the front cover is in line with the TDC mark (1, Fig. 23) on the vibration damper.

NOTE: *Be sure that the number one piston is on the compression stroke by turning both push rods by hand to determine that both valves are closed. Valves are closed when push rods are loose and can be turned easily.*

MAINTENANCE

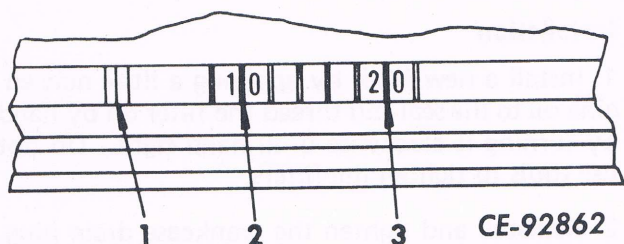


Fig. 23. Timing Marks on Vibration Damper

One Graduation = Two Degrees.

1. TDC Mark
2. 10 Degrees Before TDC
3. 20 Degrees Before TDC

4. By using the chart, all valves can be adjusted by cranking the engine only twice: four valves are adjusted when the number one piston is at TDC (compression) and the remaining two when the number one piston is at TDC (exhaust).

WITH	ADJUST VALVES					
No. 1 Piston at T.D.C. (Compression)	E	I		I	E	
No. 1 Piston at T.D.C. (Exhaust)			E			I
Cylinder Number Front)	1	2	3			

Loosen the adjusting screw lock nut on the valve lever (Fig. 24). Insert the feeler gauge (3) between the valve lever (5) and valve stem (4). Turn the adjusting screw (2) in or out as necessary to hold the feeler gauge snugly. When the correct clearance is obtained, hold the adjusting screw in place with a screwdriver, tighten the lock nut (1) and re-check the clearance.

NOTE: If valve lever adjusting screws (2, Fig. 24) are self clamping and do not have lock nuts, they must turn with more than 16 N•m (12 ft-lbs) or a new screw or new valve lever or both should be installed since it is possible that the screw will work loose.

5. Install the gasket and valve cover. Use a new gasket if necessary. Install new packing rings on the valve cover studs. Install washers and nuts.

Refer to "SPECIAL TORQUES" in Section 9. Check that the valve cover gasket makes an oil tight seal with the cylinder head.

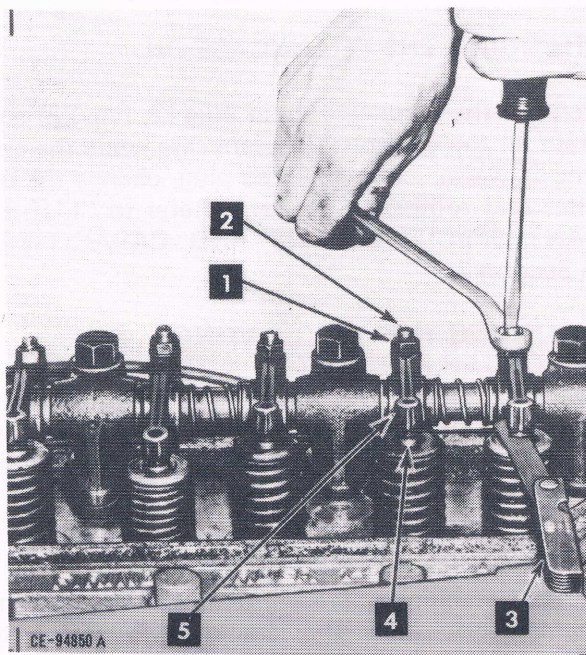


Fig. 24. Adjusting Valve Lash

OIL PUMP

A screen is attached to the oil intake of the gear-type oil pump in the crankcase. It stops large dirt particles from entering the lubricating system. This screen should be cleaned whenever the oil pan is removed.

FUEL SYSTEM

GENERAL

If a large stationary fuel storage tank is used, use a pump to remove fuel rather than a faucet. Provide a space of at least 76 mm (3 in) between the bottom of the pump suction pipe and the bottom of the storage tank for settling of sediment and water. (Refer to Fig. 25.)

Locate a drain at the opposite end of the tank. Drain off the sediment and water regularly.

Do not use the last 76 mm (3 in) of fuel in the supply tank; collect it in a container and allow it to settle. In this manner, the sediment and foreign material can be separated from the fuel and disposed of with little or no loss of fuel.

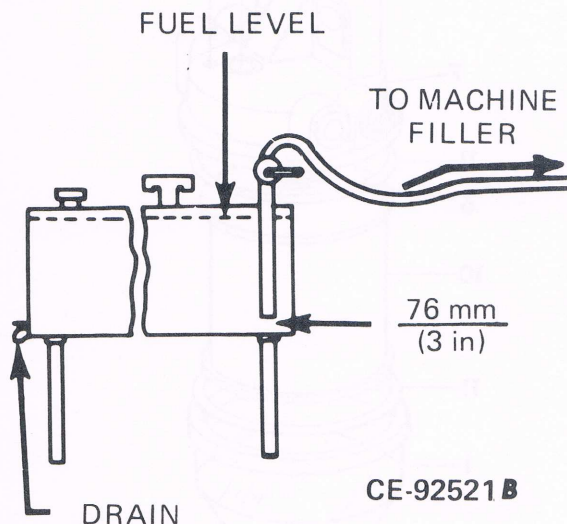


Fig. 25. Fuel Storage Tank

NOTE: Diesel fuel storage tanks and supply lines must never be galvanized, despite the fact that the zinc coating will reduce rust formation. Diesel fuel oil reacts chemically with zinc to form powdery flakes. These flakes can chip off, causing damage to the fuel injection pump.

INJECTION PUMP

The injection pump is correctly set at the factory and should require no adjustment. Whenever adjustments or repairs become necessary, consult your local PAY line distributor. Do not tamper with any of the pump units.

The warranty on the engine and/or power train components shall not apply to any failure that results from an unauthorized adjustment of the fuel injection system.

All pumping components are lubricated by the diesel fuel passing through the pump under low pressure. Therefore, the injection pump and governor are maintenance free and require no attention other than periodic external cleaning.

NOTE: Never crank the engine when the fuel system is empty, to avoid damage to the injection pump due to lack of lubricant.

FILLING THE FUEL TANK (Fig. 26)

Fill the fuel tank (1) with clean fuel free of water and other contaminants at the end of each work shift. This will keep moisture condensation to a minimum. Refer to "DIESEL FUEL SPECIFICATIONS" in this section.

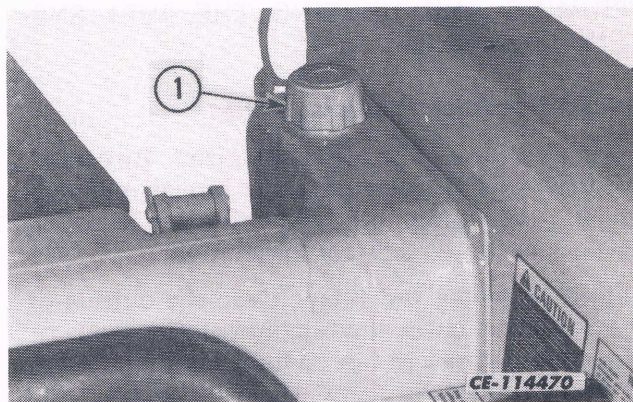


Fig. 26. Fuel Tank Filler Cap

FUEL FILTERS

The primary and final fuel filters are the center bolt replaceable element type.

The filters can not be cleaned and should not be disturbed except when it becomes necessary to replace it.

Fine particles of dirt in the fuel are extremely destructive to high pressure pumps of any description. To insure clean fuel entering the fuel injection pump, the diesel fuel passes through two stages of filtration.

The life of the filters depends upon the amount of dirt, water and sediment that they must remove. It is important that precautions be taken to keep the fuel clean and free from water during storage and in handling. This will lengthen the life of the filters.

The final fuel filter is capable of stopping particles down to 0.005 mm (0.0002 in) size. Use only genuine IH filters, available from your PAY line distributor, to be sure that they are both effective and capable of withstanding the required suction or pressure without damage to the filter element.

The final filter element will last longer if proper service is given the primary filter.

When to Replace Filters

When the engine is misfiring or a loss of power is evident, the fuel system is probably clogged. If the symptoms persist, replace the primary filter. Then if the symptoms still persist, replace the final fuel filter. It is necessary to vent the system after each of the above operations. (Refer to "PRIMING AND VENTING THE FUEL SYSTEM" in this section.

Precautions When Replacing Filters

Cleanliness cannot be overemphasized. Be careful not to allow dirt, water and other foreign materials to get on the filter. Keep new filters in the original package until ready for installation.

Before loosening the filters, clean the outside of the cases and cover thoroughly with kerosene or diesel fuel to prevent dirt or foreign material from entering the system.

Replacing the Primary or Final Fuel Filters

Before changing the fuel filters it is recommended that the fuel tanks be full.

NOTE: *This is the procedure for changing one of the filters. The procedure is the same for both.*

Removal (Fig. 28)

1. Close the three fuel shutoff valves below the fuel tank. (Fig. 27).

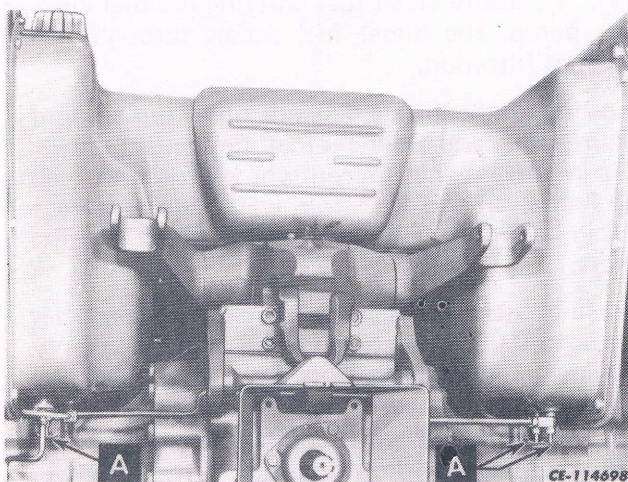


Fig. 27. Fuel Shutoff Valves

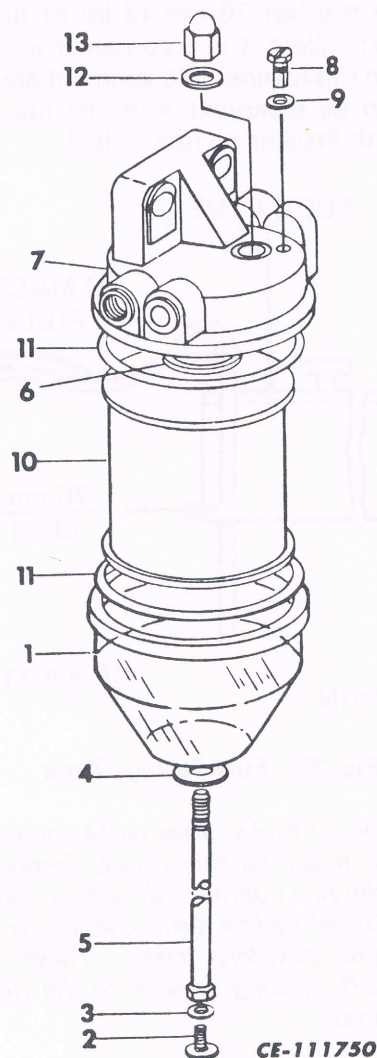


Fig. 28. Primary and Final Fuel Filters

- | | |
|-----------------|--------------------|
| 1. Glass Bowl | 8. Vent Screw |
| 2. Drain Valve | 9. Packing Ring |
| 3. Packing Ring | 10. Filter Element |
| 4. Packing Ring | 11. Packing Ring |
| 5. Hollow Bolt | 12. Packing Ring |
| 6. Packing Ring | 13. Crown Nut |
| 7. Base | |

2. Remove the vent screw (8), drain valve (2) and packing rings (3 and 9) and drain fuel in the filter.
3. Remove the crown nut (13) and packing ring (12) and lower the element (10), packing rings (4, 6 and 11), glass bowl (1) and hollow bolt (5) as a complete unit. Remove and discard the element and packing rings (6 and 11).

4. Place the glass bowl (1), hollow bolt (5), drain valve (2), vent screw (8) and crown nut (13) in a kerosene bath. Wash out any accumulated sludge and dry the parts thoroughly.

5. Check the condition of the packing rings (3, 4, 9 and 12). Replace the rings if they show any wear or deterioration.

6. Wash the underside of the base (7) with clean kerosene or solvent.

Installation

1. Reassemble the following parts in the order given:

a. Insert the hollow bolt (5) with packing ring (4) through glass bowl (1).

b. Install the element (10) and packing rings (6, 11) over the hollow bolt (5) making sure the element (10) and packing ring (11) sit squarely in the glass bowl (1).

2. Position the preassembled parts to the base making sure packing rings (6 and 11) seat squarely. Tighten the crown nut (13) with packing ring (12) to the hollow bolt (5).

3. Reinstall vent screw (8) with packing ring (9) and drain valve (2) with packing ring (3).

4. Open the three fuel shutoff valves (Fig. 27) below the fuel tank.

5. Vent the system. Refer to "PRIMING AND VENTING THE SYSTEM" in this section.

6. Start the engine and check the filters for leaks; correct all leaks.

PRIMING AND VENTING THE FUEL SYSTEM

All air must be eliminated from the fuel lines before the engine will operate properly. All fuel line connections must be tight to prevent leakage and to prevent air from entering the system. The system must be primed and vented when:

An engine has not been operated for an extended period of time.

An engine in operation, runs out of fuel.

Fuel filters have been replaced.

Fuel piping has been disconnected or loosened.

To Vent the Fuel System

1. Backout the vent screw (1, Fig. 29) of the primary fuel filter until the outflowing fuel is free of air. Retighten the vent screw.

NOTE: *The fuel tank should be full before venting the system.*

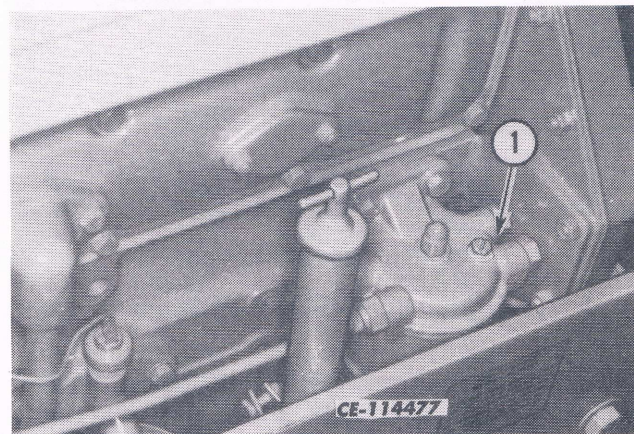


Fig. 29. Primary Fuel Filter Vent Screw

1. Vent Screw

2. Backout the vent screw (1, Fig. 30) of the final fuel filter until the outflowing fuel is free of air. Retighten the vent screw.

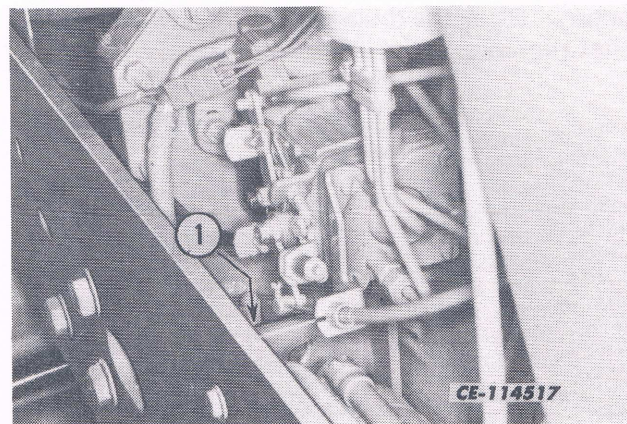


Fig. 30. Final Fuel Filter Vent Screw

1. Vent Screw

3. Crack open the fuel inlet screw (1, Fig. 31) on the fuel injection pump (2) until the outflowing fuel is free of air. Retighten the screw.

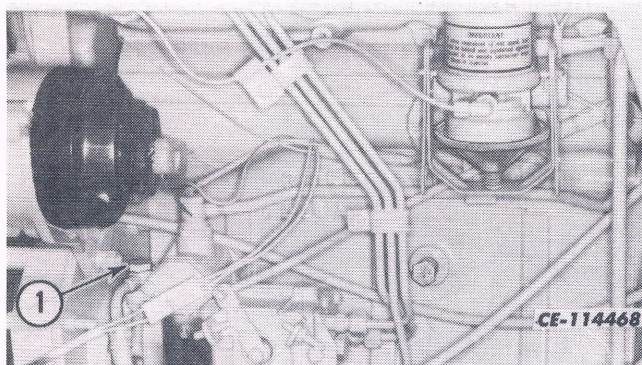


Fig. 31. Fuel Inlet Screw

1. Injection Pump Fuel Inlet Screw

4. Crack open the three fuel line fittings at the injection nozzles. Crank the engine until the outflowing fuel is free of air. Retighten the three fittings.

DRAINING WATER FROM THE FUEL SYSTEM (Fig. 32)

Open the drain valves at the bottom of the primary (1) and final (2) fuel filters until clear diesel fuel appears. Close the drain valve. Drain while engine is not running.

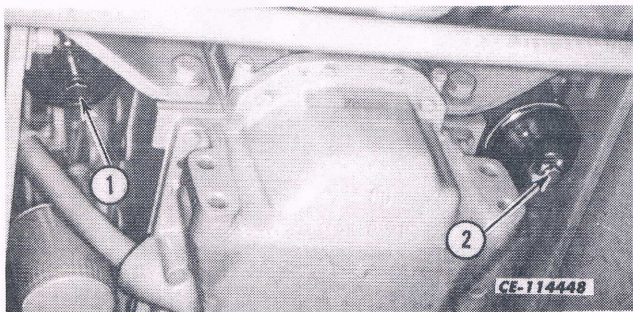


Fig. 32. Fuel Filter Drain Valves

1. Primary Fuel Filter Drain Valve
2. Final Fuel Filter Drain Valve

DIESEL FUEL SPECIFICATIONS

Type of Operation	Preferred Specifications (*)
Normal Service Above -12°C (10°F)	ASTM D-975 Grade 2-D ASTM D-396 Grade 2
Below -12°C (10°F) or Extended Idling	ASTM D-975 Grade 1-D ASTM D-396 Grade 1

(*) ASTM refers to American Society For Testing and Materials. The D-396 fuels must also meet the cetane number and sulfur requirements of the D-975 specifications.

Optionally, the equivalent grades of recognized Federal Government specifications may be used — latest revisions of VV-F-800a.

HYDRAULIC SYSTEM

BASIC HYDRAULIC SYSTEM

The basic hydraulic system provides hydraulic power to the power steering system at all speeds and furnishes hydraulic flow for hitch, and/or loader (if equipped) operation. The transmission housing and rear frame serve as the hydraulic reservoir.

The main pump draws part of its supply from the return tubes and remainder from the rear frame through a full flow filter which protects the hydraulic system from foreign matter. A large bypass valve at the outside end of the filter admits fluid through a screen, should filter resistance become excessive through clogging or because of cold oil.

CHECKING THE OIL LEVEL

Prepare the machine for an oil level check as follows.

Hydrostatic Drive: Start the engine. Operate the hydrostatic drive and hydraulic equipment to warm the oil (approx. 3 minutes). Park the machine on level ground, position hydraulic equip-

ment as described below and apply the parking brake. Place the transmission range lever in "N" (neutral) and set the hand throttle control so the engine is running at 1000 RPM.

The forward reverse pedals (foot control) or the forward/reverse control lever must be in neutral.

Synchromesh or Torque Converter Transmission: Check the level while the hydraulic fluid is cold. The machine should be parked on level ground with the hydraulic equipment positioned as described below.

PAY® tractor: Wheels to be in the straight ahead position.

PAY loader: Position the loader so all hydraulic cylinders are fully retracted. Wheels should be in straight ahead position.

Check the oil level as follows:

1. Loosen and remove the oil level gauge from the tube.
2. Wipe the gauge clean and insert it all the way back into the tube.
3. Remove the gauge again and check the level. The correct level is up to the top arrow. If the level indicated is below the bottom of the arrow add oil until the level is up to the top arrow.

NOTE: If the machine is to be operated under severe slope conditions (greater than 20° angle), add oil to bring the level to the line (A, Fig. 33) 38.1mm (1-1/2-inches) (B) above the top of the arrow (C). This level will prevent cavitation of the hydraulic pumps.



CAUTION! Always loosen the filler cap slowly to relieve pressure in the system.

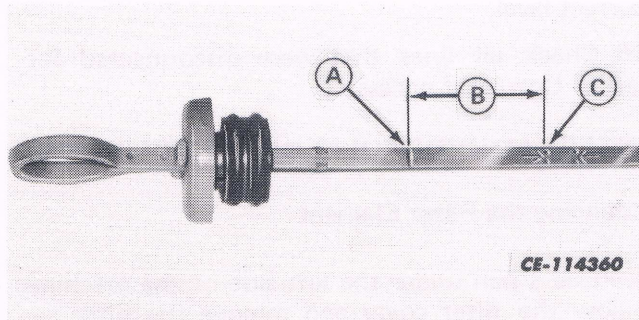


Fig. 33. Dipstick Severe Slope Full Mark

CHANGING THE HYDRAULIC OIL

1. Operate the machine and equipment until the hydraulic fluid becomes warm.
2. Park the machine on level ground. Apply the parking brake.
3. Retract the loader bucket cylinder and lower the loader to the ground (if equipped).
4. Turn the front wheels all the way to the right.
5. Stop the engine.
6. Place a suitable pan under the three drain (1, Fig. 34) and remove the plugs. Allow the fluid to drain. Remove the level gauge to vent the housing and speed draining.

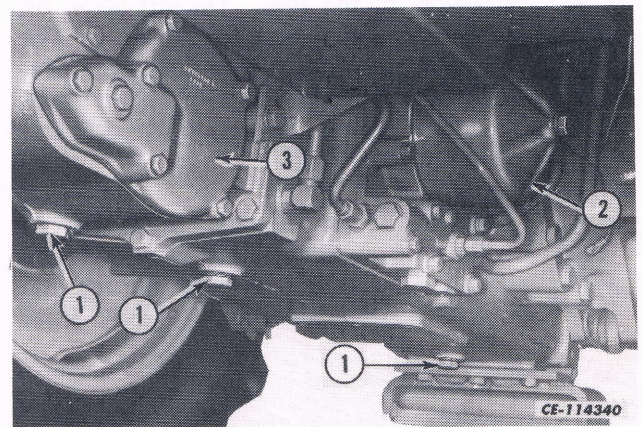


Fig. 34. Drain Plugs and Filter Location

1. Drain Plugs
2. Hydraulic Fluid Filter
3. Hydrostatic Transmission Fluid Filter

7. Replace the hydraulic filter element (2, Fig. 34). Refer to "HYDRAULIC FLUID FILTER" in this section.

8. HYDROSTATIC TRANSMISSION ONLY: Replace the hydrostatic transmission fluid filter (3, Fig. 34). Refer to "HYDROSTATIC DRIVE HOUSING, HYDRAULIC OIL FILTER AND BYPASS SCREEN" in this section.

9. Clean the transmission breather. Refer to "TRANSMISSION BREATHER" in this section.

10. Install the three drain plugs.

11. Refill with fresh hydraulic fluid. Refer to "FILLING THE SYSTEM" in this section.


MAINTENANCE


12. The following procedure explains how to change the oil in the cylinders and hoses.

NOTE: *If any cylinder is moved without this specific routine being followed, contaminated fluid will be returned to the system and oil reservoir in a quantity equal to the amount displaced by the cylinder in question.*

NOTE: *After each cylinder has been purged, check the hydraulic fluid level and refill as necessary.*

NOTE: *Use a suitable container to collect purged fluid.*

 **CAUTION!** Loosen hose connections very slowly to gradually release trapped pressure in the line. Do not allow oil under pressure to strike the skin. The oil in the lines is at operating temperature. Protect yourself against the possibility of burns. Wear safety goggles to protect your eyes.


 **CAUTION!** The engine must be off when disconnecting and connecting lines. Run the engine during the purging operation only.

a. Steering Cylinder

Disconnect both lines at the steering cylinder. Start the engine. Slowly turn the steering wheel first counterclockwise and then clockwise to expel all old fluid from the lines. Stop the engine. Reconnect the line to the rod end of cylinder. Start the engine. Slowly turn the steering wheel counterclockwise to expel old fluid from the cylinder. Stop the engine. Reconnect the line to the piston end of the cylinder.

b. Loader Lift Cylinders

NOTE: *The loader lift cylinders must be purged in pairs.*

 **CAUTION!** Do not allow anyone under the boom while in the raised position.

Disconnect both lines at each end of the cylinders. Start the engine. Slowly feather the loader control lever to the full raise position then to full lower position to expel old fluid from the lines. Stop the engine. Reconnect

the lines to the rod end of the cylinders. Start the engine. Slowly feather the loader control lever to the full raise position to expel old fluid from the cylinders. Stop the engine. Reconnect the lines to the piston end of the cylinders. Start the engine. Lower the boom to the ground. Stop the engine.

c. Loader Bucket Cylinders

NOTE: *The lower bucket cylinders must be purged in pairs.*

Disconnect both lines at each end of the cylinders. Start the engine. Slowly feather the loader control lever to the full roll back position then to full dump position to expel old fluid from the lines. Stop the engine. Reconnect the lines to the piston end of the cylinders.

NOTE: *The bucket may drift into the dump position when the loader is raised due to the rod end ports being open.*

 **CAUTION!** Do not allow anyone under the loader while it is being raised.

Start the engine. Slowly raise the loader so that there is enough clearance for the bucket to clear the ground when the bucket is in the full dump position. Slowly feather the loader control lever to the full dump position to expel old fluid from the cylinders. Lower the bucket to the ground. Stop the engine. Reconnect the lines to the rod end of the cylinders.

13. Check the hydraulic fluid level and refill if necessary.

14. Start the engine. Cycle all cylinders at least 20 times to eliminate all air from the cylinders and lines.

15. Stop the engine. Check the hydraulic fluid level and add fluid if necessary to bring to the correct level.

16. Check all lines that were disconnected for leaks. Correct if necessary.

INTERNAL HYDRAULIC OIL FILTER (Fig. 35)

Changing the Filter Element

1. Place a pan under the left side of the machine below the filter cover and remove the filter assembly. Some of the fluid will drain into the pan.

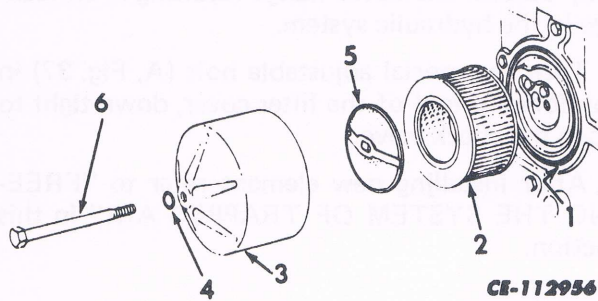


Fig. 35. Hydraulic Fluid Filter Disassembled

1. Filter Case Gasket
2. Element
3. Filter Cover
4. "O" Ring
5. Bypass Valve and Screen
6. Bolt

2. Remove the filter element (2) and bypass valve (5) from the cover. Discard the filter element.

3. Disassemble the bolt (6), "O" ring (4) and cover (3).

4. Remove the used filter case gasket (1) on multiple control valve flange and "O" ring (4), and discard. Replace with new gasket and "O" ring. Lubricate both gasket and "O" ring with HY-TRAN fluid before installation.

5. Clean the bypass valve screen (5) with a brush using kerosene or diesel fuel.

6. Make a visual check to insure a space exists between each of the four metal legs and the phenolic valve, after cleaning bypass valve screen, or on a new bypass valve.

7. Assemble bypass valve and element in cover and insert bolt into multiple control valve flange. Hold filter cover against multiple control valve flange with enough pressure to overcome bypass spring load. Tighten bolt finger tight while holding cover against multiple control valve flange. During last few turns of the bolt also rotate filter cover assembly along with bolt. Take care to insure the filter cover is positioned properly in the groove when tightening the bolt. When the filter cover bolt is finger tight use wrench to torque the bolt. Do not overtighten. The bolt should be torqued to 16 to 22 N•m (12 to 16 ft-lbs).

NOTE: Check to make sure the rubber grommet stays attached to the bypass valve while passing the bolt through it.

Check to make sure phenolic valve is seated at points "A" (Fig. 36).

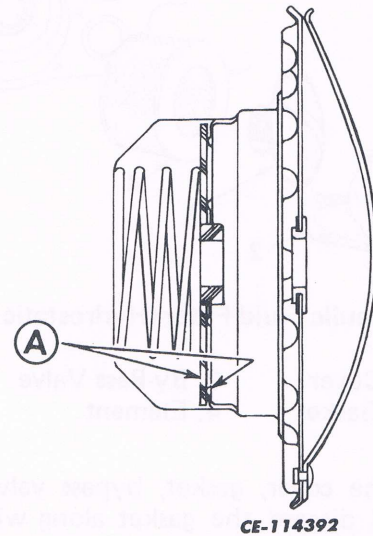


Fig. 36. By-pass Valve

HYDROSTATIC DRIVE HOUSING OIL FILTER AND BYPASS SCREEN

In addition to the hydraulic oil filter a hydrostatic drive machine has a drive housing fluid filter to be serviced.

This filter, located on the left side of the hydrostatic drive housing, keeps foreign matter from entering the drive housing.

Clean the bypass valve screen and replace the filter element whenever the transmission hydraulic fluid is changed.

To avoid delays, keep extra filter element packages on hand so replacement can be made at the proper time.

The following sequence of filter service should be followed when the filter element is changed.

1. Place a pan under the left side of the machine below the filter opening.

2. There is a special adjustable bolt (A, Fig. 37) in the forward end of the filter cover. Back this bolt out 9.5 mm (3/8 in) so that the check valve can seat. This prevents oil from draining out of the transmission during filter change.

MAINTENANCE

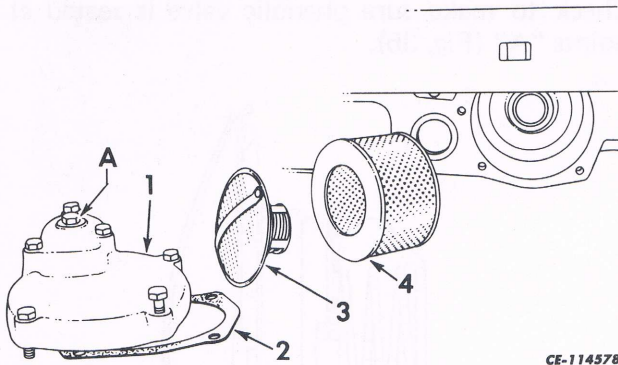
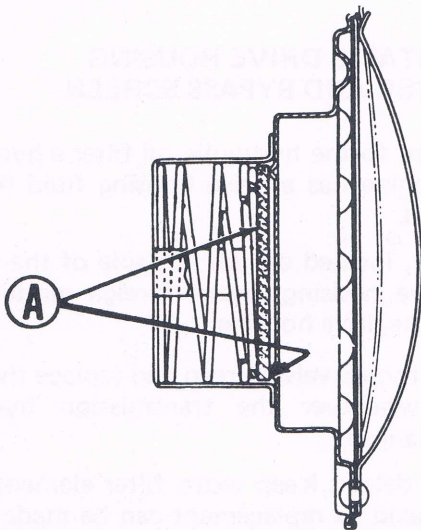


Fig. 37. Hydraulic Fluid Filter (Hydrostatic Drive)

- | | |
|-----------|------------------|
| 1. Cover | 3. By-Pass Valve |
| 2. Gasket | 4. Element |

3. Remove the cover, gasket, bypass valve, and element, and discard the gasket along with the element. Some fluid will drain into the pan.

4. Clean the bypass valve screen with a brush using kerosene or diesel fuel. Be sure phenolic valve is seated at points (A, Fig. 38).



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Fig. 38. By-pass Valve

5. Insert the new element (4, Fig. 37) into the opening in the hydrostatic drive unit and the bypass valve (3) into the outside of the element.

6. Holding the assembly in place, reinstall the fluid filter opening cover (1, Fig. 37) using the previously removed cap screws. Do not overtighten as they

may deform the cover flange resulting in air leakage in the hydraulic system.

7. Turn the special adjustable bolt (A, Fig. 37) in the forward end of the filter cover, down tight to open the check valve.

8. After installing new element refer to "FREEING THE SYSTEM OF TRAPPED AIR" in this section.

FILLING THE SYSTEM

NOTE: Always use clean oil from a clean container. Correct all leaks.

1. Be sure the three drain plugs are in place.
2. Clean all dirt and trash away from the filler plug and surrounding area.
3. MACHINES WITH DRAFT CONTROL: the filler plug is located at the rear and top of the draft control cover. Remove the filler plug.
3. MACHINES WITHOUT DRAFT CONTROL: the filler plug is located at the rear and top of the rear frame cover. Remove the filler plug.
4. Add fresh oil to the reservoir through the filler hole to bring to the correct level. Refer to "LUBRICATION, SPECIFICATIONS AND CAPACITIES" in Section 7.
5. Install the filler plug.

FREEING THE SYSTEM OF TRAPPED AIR

Start the engine and operate it at a moderate idle speed. Slowly move the control levers back and forth ten or twelve times through their full range of travel. Move the steering wheel, first to one extreme, then to the other, and then back to center. This frees the system of trapped air.

Then with the levers in the neutral position, stop the engine. If necessary, add fluid up to the proper level in the transmission case.

TRANSMISSION BREATHER

To prevent false transmission oil level readings, the transmission breather must be cleaned. Refer to "SCHEDULED MAINTENANCE" in Section 7. The breather is located on the rear frame cover,

or on top of the draft control housing (if equipped). Dust and trash that has accumulated in the area of the breather must be removed before removing the breather.

1. Remove breather from machine.
2. Disassemble and remove filter element.
3. Wash in commercial cleaning solvent to completely remove any contaminants.
4. Dry thoroughly using a light pressure of compressed air or shake to remove as much solvent as possible.
5. Reassemble and install the breather back in place.

SEAT BELT



CAUTION! Do not bleach or redye color of webbing as same may cause a severe loss of tensile strength.

The entire seat belt assembly should be inspected periodically for corrosion, wear, fraying or weak spots. The seat belt mounting bolts should also be periodically inspected for looseness.

STARTING AID



CAUTION! Observe the precautions printed on the container when using or storing this fluid and when discarding the empty containers. Ether is highly flammable.

NOTE: Improper starting fluid can cause valve seizure and severe damage to the engine. Consult your authorized PAY® line distributor for the recommended starting fluid to be used.

CHANGING THE ETHER FLUID CONTAINER

1. Turn the knurled adjusting screw clockwise until the starting fluid container can be removed from the injector body (Fig. 39). Discard the container.
2. Install the new container inside the bail.

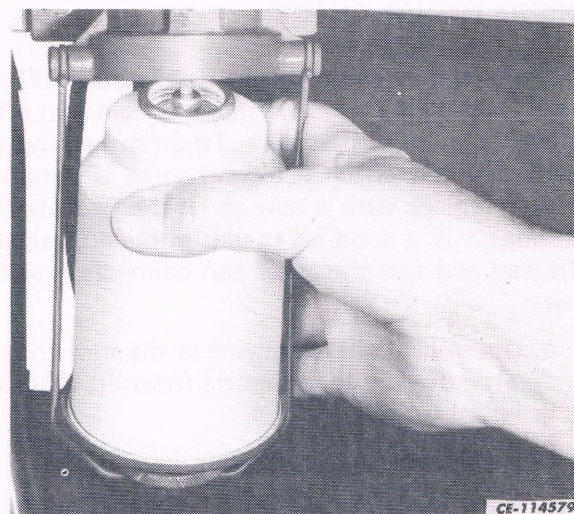


Fig. 39. Removal of Ether Can (Typical Illustration)

3. Tighten the knurled adjusting screw (turning counterclockwise and, at the same time, guide the container head into the injector body).
4. Turn the can back and forth to be sure it is seated properly in the injector body. Tighten the knurled adjusting screw to hold the container firmly in position.

The ether start injector has a dual position bail assembly. The dual position bail permits the use of the bail cup (A, Fig. 40) as a protective plug when the ether container is not in place.

NOTE: Either the ether container or the protective plug should be in place at all times to prevent the injector from sucking in dust.

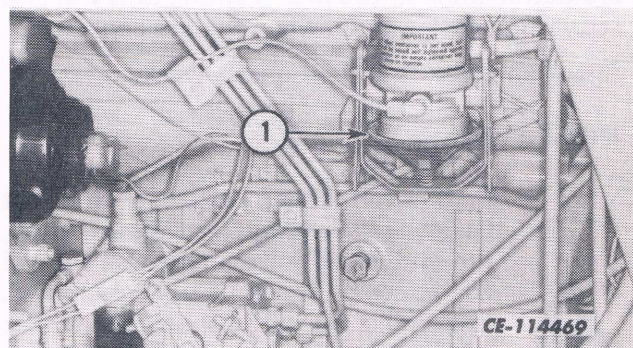


Fig. 40. Ether Ball in Storage Position

MAINTENANCE

OPERATIONAL CHECK

If the engine does not begin firing within 30 seconds, release the key and make certain that ether is available under pressure. To do so, remove the ether can and check if a good spray is obtained. If not, replace with a new can and repeat starting attempt. If a good spray was obtained, reinstall the can and test the ether can connection as follows:

- a. Disconnect the ether line at the spray nozzle and remove the spray nozzle from the air cleaner outlet tube.
- b. Reconnect nozzle to ether line.
- c. Turn the key switch to on position, press the ether injection pushbutton, and observe spray (should be cone shaped).
- d. Dribbling or no spray indicates a blocked spray nozzle or lack of ether pressure.

Clean the blocked nozzle or install a new can of ether as needed.

TIRES

GENERAL

Avoid stumps, stones, deep ruts, and other hazards. Cuts in tires should be repaired immediately, as neglect decreases tire life. Keep the tires free from oil and grease, as both destroy rubber. Remove any chemicals that may get on the tires.

Never vent built-up pressure in a tire, such as encountered on extremely hot days. Pressure built up on hot days actually protects the tires by avoiding excessive sidewall flexing and heat, which are detrimental to tire life. Venting tires will also result in under inflation when the tire cools.

Check air pressure at least once a week.

INFLATION

CAUTION! Never inflate a tire that has gone flat without inspecting the tire, rim and wheel for damage. Be sure all components are properly assembled. Inflate the tire to 5 psi and check that all components are properly seated. Never stand directly in front of a tire and rim assembly while inflating. Use a clip on chuck with a hose long enough to allow the person inflating the tire to stand to the side.



Keep the tires properly inflated to the pressure listed in "SPECIFICATIONS" in Section 9. Underinflation will damage the tire cord body and may cause the tire to slip on the rim and tear out the tube valve stem. Over-inflation results in excessive slippage, causing rapid tire wear.

The tires can be inflated with a pressure pump or hand pump.

Always see that the tire valve caps are in place and are tightened securely to prevent the loss of air and protect the valve core.

MOUNTING TIRES ON THE RIM

After mounting a new or old tire on the rim, inflate it to thirty pounds pressure to seat the tire bead on the rim flange and to prevent the tire from creeping and shearing off the valve. Then deflate or inflate the tire to the correct operating pressure.

TRACTION AND WEIGHTS

The machine should not be operated with the tires improperly inflated. To insure the maximum hours of service, watch the tread lugs; if they wear down too fast, immediately add more weight to cut down slippage. Check for high air pressure.

TIRE CHAINS

In set ground conditions or ice and snow, use lug-type chains. The flexing of the tires and the creeping of chains will break the mud loose as the wheel rotates.

NOTE: *There is a possibility of the tire slipping within the chain; to prevent this, the use of spring-type chain fasteners is recommended.*

BALLAST (COUNTERWEIGHT)

Weight may be added to the rear of the machine to counterbalance the weight of the loader. On the PAY® loader, approximately 272 kg (1600 pounds) placed 1270 mm (50 inches) behind the machine rear axle is recommended as ballast at the rear of the machine. Rear mounted equipment, or weights attached to the machine hitch can be used as counterweights. These counterweights not to include solution in the tires or wheel weights.

LIQUID BALLAST

Tires can be three-quarters filled with liquid, using clean water for temperatures above freezing 0°C (+32°F). A calcium chloride solution (CaCl_2) is recommended when operating in freezing temperatures.

Purchase an adapter from your PAY® Line distributor. The adapter is equipped with a bleeder for letting out the air displaced by the liquid.

HYDRO-FLATION PROCEDURE

Inflating

1. With a jack under the machine, rotate the wheel so the valve stem is at the top and deflate the tire to not less than 34.5 kPa (5 psi).

2. Using the jack, lower the machine until the tire is deflected slightly.

NOTE: *The valve stem must be at the top.*

3. Attach hydro-flation adaptor to valve and remove core housing.

4. Start hydro-flation of the tire. Check pressure in the tire every few minutes with pump gauge by placing pump in neutral. If pressure exceeds 138 kPa (20 psi), leave pump in neutral until the pressure is bled back to not less than 34.5 kPa (5 psi). After pressure is lowered, continue pumping. Repeat above steps as often as necessary to fill tire to the desired level.

Deflation

1. Raise the machine with a jack and rotate the wheel to position the valve stem in its bottom most position. Then lower the machine to where the tire is just in contact with the ground.

2. Attach hydro-flation adaptor to valve and remove core housing.

3. Apply vacuum and continue pumping until all solution is removed.

Inflation pressure should be checked frequently as the air volume is relatively low and any air loss results in a greater pressure decrease in a hydro-flated tire. The tire pressure should be checked with an accurate air-water gauge with the valve stem at the bottom.

NOTE: *If the water or calcium chloride solution is removed from the tire, it is necessary to demount the tire and remove all traces of the calcium chloride solution from the rim and the tire by washing with soap and water. The tire and rim must be completely dry before remounting.*

Liquid Ballast for Freezing Temperatures

Calcium chloride solution, using a 25 percent mixture, which is approximately 9 kg (20 lbs) of flaked calcium chloride to 37.8 l (10 U.S. gals) of water, is recommended when freezing temperatures prevail.

The strength of the solution can be checked with a battery hydrometer. A 25 percent solution measures approximately 1.225 specific gravity and has a freezing point of -31.7°C (-25°F).

NOTE: *Some calcium chloride flakes have an acid reaction. It is advisable to add one pound of lime to each 45 kg (100 lbs) of calcium chloride used.*

WHEEL HUB

LUBRICATING THE FRONT WHEEL (Fig. 41)

1. Apply the parking brake. Place blocking behind and in front of the rear wheels.

2. Loosen the front wheel mounting bolts.

3. Raise the front of the machine up using a suitable jack. Position safety stands under each side of the front axle to prevent axle oscillation. Lower the machine on to the safety stands.

4. Remove the front wheel mounting bolts and front wheel.

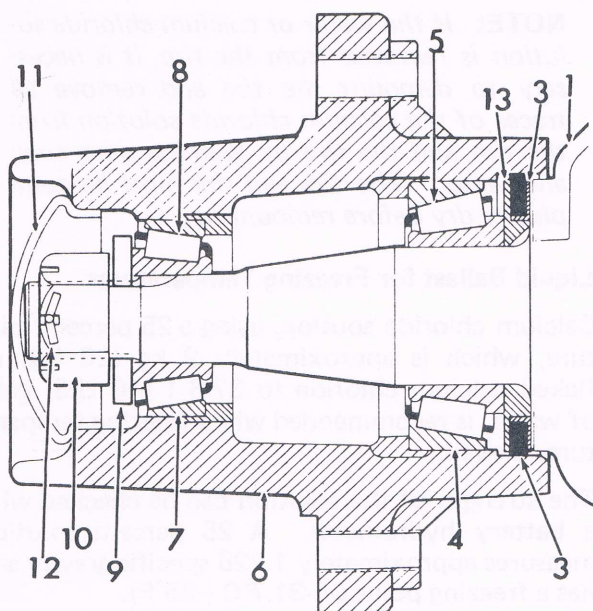
5. Remove the hub cap (11), cotter pin (12), retaining nut (10) and washer (9).

6. Pull the wheel hub (6) out far enough to remove the outer bearing cone (8). Place the bearing in a clean container.

7. Remove the wheel hub (6).

8. Remove the inner bearing cone (5). Place the bearing in a clean container.

9. Remove the seal retainers (13 and 14) and felt seal (3) from the steering knuckle spindle (1).



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Fig. 41. Front Wheel Hub

1. Steering Knuckle Spindle
3. Felt Seal
4. Inner Bearing Cup
5. Inner Bearing Cone
6. Wheel Hub
7. Outer Bearing Cup
8. Outer Bearing Cone
9. Washer
10. Retaining Nut
11. Hub Cap
12. Cotter Pin
13. Seal Retainer
14. Seal Retainer

10. Wash the wheel hub (6), washer (9), retaining nut (10), hub cap (11) and seal retainers in a clean oil solvent. Dry thoroughly with compressed air. Check the condition of the inner and outer bearing cups (4 and 7) inside of the wheel hub. Replace the bearing cups if they show any scoring or deterioration.

11. Clean the bearing cones (5 and 8) in a clean oil solvent with special effort taken to protect

their finely machined surfaces. Dry thoroughly with compressed air.

NOTE: *DO NOT spin dry the bearing cones.*

12. Wash the steering knuckle spindle (1) with a clean oil solvent. Dry thoroughly with compressed air.

13. Discard felt seal (3) and cotter pin (12) and replace with new ones.

14. Install the seal retainers (13 and 14) and new felt seal (3) on the steering knuckle spindle (1).

15. Coat the steering knuckle spindle and the inside of the wheel hub (6) with a liberal amount of fresh grease. Refer to "LUBRICANT, SPECIFICATIONS AND CAPACITIES" in Section 7.

16. Pack the inner bearing cone (5), with a liberal amount of fresh grease. Install the bearing cone on the steering knuckle spindle until it bottoms out.

17. Install the wheel hub (6) on the steering knuckle spindle.

NOTE: *When placing the hub on the steering knuckle spindle, care must be exercised to avoid damaging the seal and bearing.*

18. Pack the outer bearing cone (8) with a liberal amount of fresh grease. Install the bearing cone and washer (9) on the steering knuckle spindle.

19. Install the retaining nut (10) and torque to 95 N•m (70 ft-lb) while rotating the wheel hub (6). Back off the retaining nut and retorqued to 34 N•m (25 ft-lb) while rotating the wheel hub. Back off the retaining nut approximately 1/4 turn and install the new cotter pin (12).

20. Install the hub cap (11).

21. Install the wheel and tighten the mounting bolts hand tight.

22. Raise the machine up, remove the jackstands and then lower the machine to the ground.

23. Torque the wheel mounting bolts. Refer to "SPECIAL TORQUES" in Section 9.

NOTE: *Check wheel mounting bolt torque every 10 hours of machine operation until torque stabilizes.*

SPECIFICATIONS AND CAPACITIES

SECTION 9
Page 1

CAPACITIES (APPROXIMATE)

COOLING SYSTEM	13.2 l. (3.5 gal.)
CRANKCASE	
With filter change	7.6 l. (8 qts.)
Without filter change	6.6 l. (7 qts.)
FUEL TANK	75.7 l. (20 gal.)
TRANSMISSION AND HYDRAULIC SYSTEM	(Common reservoir) (Total fill)
Hydrostatic transmission	
Tractor	53.0 l. (14 gal.)
Loader	70.0 l. (18.5 gal.)
Synchromesh transmission	
Tractor	34.0 l. (9.0 gal.)
Loader	51.0 l. (13.5 gal.)
Torque Convertor transmission	
Loader	57.0 l. (15.0 gal.)

SPECIFICATIONS

AXLES

Type

Front	Cast I-beam rated @ 4563 kg (10,000 lb) working capacity.
Rear	Live type, flanged axles mounted on tapered roller bearings in cast iron carriers with inboard planetaries.

BRAKES

Foot	Hydraulic, disc type, manually operated individual or interlocked.
Parking Brake	Lever type, banded internal drum on bevel pinion shaft.

ENGINE

Make and Model	I.H. D-179
Type	Naturally aspirated
Number of cylinders	3
Bore	98.4 mm (3.87 in.)
Stroke	128.5 mm (5.06 in.)
Displacements	2.93 l. (179 in. ³)
Engine speeds	
High idle (No load)	
Hydrostatic or Torque Convertor	Approx. 2650 RPM
Synchromesh	Approx. 2480 RPM
Governed speed (Full load)	
Hydrostatic or Torque Convertor	2400 RPM
Synchromesh	2200 RPM
Low idle	
Hydrostatic or Torque Convertor	Approx. 700 RPM
Synchromesh	Approx. 700 RPM
Valve clearance (engine warm)	
Intake	0.25 mm (0.01 in.)
Exhaust	0.30 mm (0.012 in.)
Starting system	12 volt

SPECIFICATIONS AND CAPACITIES

ELECTRICAL

Alternator output	28 amperes
Battery	One 12 volt
Fuse	Cartridge type, 25 amperes
System voltage	12 volt, negative ground
HITCH (If Equipped)	3 point hitch, category I with hydraulic draft control. Torsion bar sensing device.

HYDRAULIC SYSTEM

Pumps	Internal - Type
Tractor	47.3 lpm (12.5 gpm)
Loader	
Hydrostatic and Synchromesh	64.3 lpm (17 gpm)
Torque Converter	70 lpm (18.5 gpm)
Charge (Torque Converter only)	42 lpm (11.25 gpm)
Reservoir	Internal, located in rear frame with a common oil supply for power train, hydraulic system and brakes.
Filtration	One 25 micron suction filter.
Hydrostatic transmission	One 25 micron suction filter.

LOADER

Bucket capacities	Struck	Heaped
1778 mm (70 in.) standard bucket	0.573 m ³	(3/4 yd ³)
1549 mm (61 in.) optional bucket	0.382 m ³	(1/2 yd ³)
2006 mm (79 in.) optional bucket	0.67 m ³	(7/8 yd ³)
2108 mm (83 in.) snow bucket	0.955 m ³	(1-1/4 yd ³)
Cylinders		
Boom		
Bore	63 mm (2.5 in.)	
Stroke	728 mm (28.7 in.)	
Bucket		
Bore	63 mm (2.5 in.)	
Stroke	571 mm (22.5 in.)	
Dimensions (See NOTE)		

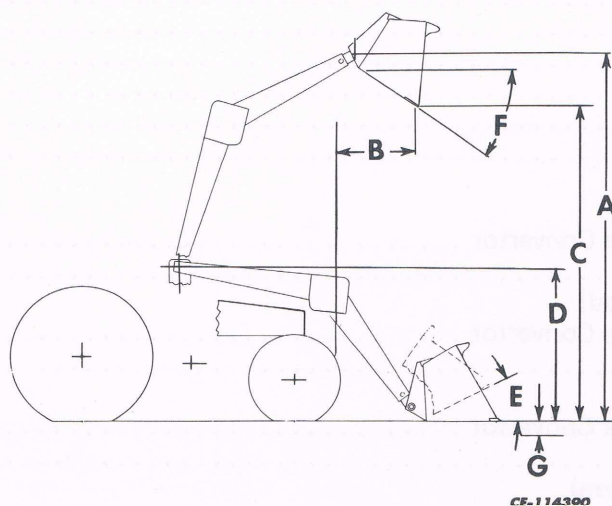


Fig. 1. Loader Dimensions

SPECIFICATIONS AND CAPACITIES

SECTION 9

Page 3

A. Height to hinge pin	3.2 m (10 ft. 6 in.)
B. Dump reach	0.5 m (1 ft. 6 in.)
C. Dump clearance	2.59 m (8 ft. 8 in.)
D. Height (boom lowered)	1.68 m (5 ft. 6 in.)
E. Roll back (ground level)	30°
F. Dump angle	45°
G. Digging depth below ground level	0.1 m (4 in.)

Front axle oscillation 22°

NOTE: Dimensions are based on 7.50 x 16-8 ply F3 front tires and 14.9 x 24-6 ply R4 rear tires.

Capacities (maximum)

Breakout force	1996 kg (4400 lbs.)
Lift	1497 kg (3300 lbs.)
Operating	1043 kg (2300 lbs.)

TIRES

Size and Inflation Pressure

Tractor

Standard

Front	7.50 x 16-8 ply (F3) 308 to 330 kPa (44 to 48 psi)
Rear	14.9 x 24-6 ply (R4) 124 to 137 kPa (18 to 20 psi)

Optional

Front	11L x 16-3 ply (F3) 248 to 275 kPa (36 to 40 psi)
Rear	16.9 x 24-6 ply (R4) 110 to 124 kPa (16 to 18 psi)
Rear	14.9 x 28-6 ply (R4) 124 to 137 kPa (18 to 20 psi)
Rear w/heavy duty disc	16.9 x 24-6 ply (R4) 110 to 124 kPa (16 to 18 psi)

Lo Boy attachment

Front	w/4 PR 9.00 - 10 137 to 165 kPa (20 to 24 psi)
Rear	6 PR 18.4 x 16.1 R3 82 to 110 kPa (12 to 16 psi)
Front (Terra Rib)	w/4 PR 26. x 12-12.4 27 to 110 kPa (4 to 16 psi)
Rear (Terra Rib)	4 PR 33 x 20-16-16.1 27 to 96 kPa (4 to 14 psi)

TRANSMISSION

Hydrostatic Multiple piston axial type hydraulic pump and motor combined to form a closed circuit hydraulic drive system between engine and range transmission with infinite variable speeds.

Ground speed KPH (MPH) @ 2400 RPM engine speed.

TIRE	SIZE	14.9 x 24		14.9 x 28		16.9 x 24	
	TYPE	R4		R4		R4	
	RANGE	FWD	REV	FWD	REV	FWD	REV
HAND CONTROL	LOW	7.8 (4.8)	3.3 (2.05)	8.3 (5.1)	3.6 (2.2)	8.1 (5.0)	3.5 (2.1)
	HIGH	29.7 (18.4)	12.7 (7.9)	31.9 (19.8)	13.7 (8.5)	30.9 (19.2)	13.2 (8.2)
FOOT CONTROL	LOW	7.8 (4.8)	6.9 (4.3)	8.3 (5.1)	7.4 (4.6)	8.1 (5.0)	7.1 (4.4)
	HIGH	29.7 (18.4)	26.3 (16.3)	31.9 (19.8)	28.3 (17.5)	30.9 (19.2)	27.3 (16.9)

SPECIFICATIONS AND CAPACITIES

TRANSMISSION (Continued)

Synchromesh The 8F - 4R gear drive transmission is comprised of 4 synchromesh in-line gears that have a high-low and reverse range. The speed-gears in this transmission can be changed on the go with full depression of the clutch and no gear teeth clash. Changing from high to low range requires a full stop.

Ground speed KPH (MPH) @ 2200 RPM engine speed.

TIRE	SIZE		14.9 x 24		14.9 x 28		16.9 x 24	
	TYPE		R4		R4		R4	
		GEAR	FWD	REV	FWD	REV	FWD	REV
RANGE	LO	1ST	2.9 (1.8)	3.5 (2.17)	3.1 (1.93)	3.7 (2.3)	3.0 (1.86)	3.6 (2.24)
		2ND	4.7 (2.92)	5.6 (3.48)	5.0 (3.11)	6.1 (3.79)	4.9 (3.04)	5.9 (3.67)
		3RD	6.3 (3.91)	7.6 (4.72)	6.8 (4.23)	8.2 (5.1)	6.6 (4.1)	7.9 (4.91)
		4TH	8.1 (5.03)	9.8 (6.09)	8.8 (5.47)	10.5 (6.52)	8.5 (5.29)	10.2 (6.34)
	HI	1ST	11.1 (6.9)	—	11.9 (7.39)	—	11.5 (7.15)	—
		2ND	18.0 (11.2)	—	19.3 (12.0)	—	18.7 (11.6)	—
		3RD	24.3 (15.1)	—	26.1 (16.2)	—	25.3 (15.7)	—
		4TH	31.3 (19.4)	—	33.6 (20.9)	—	32.5 (20.2)	—

Torque Convertor Six speeds forward 3 reverse w/full hydraulic reverse.

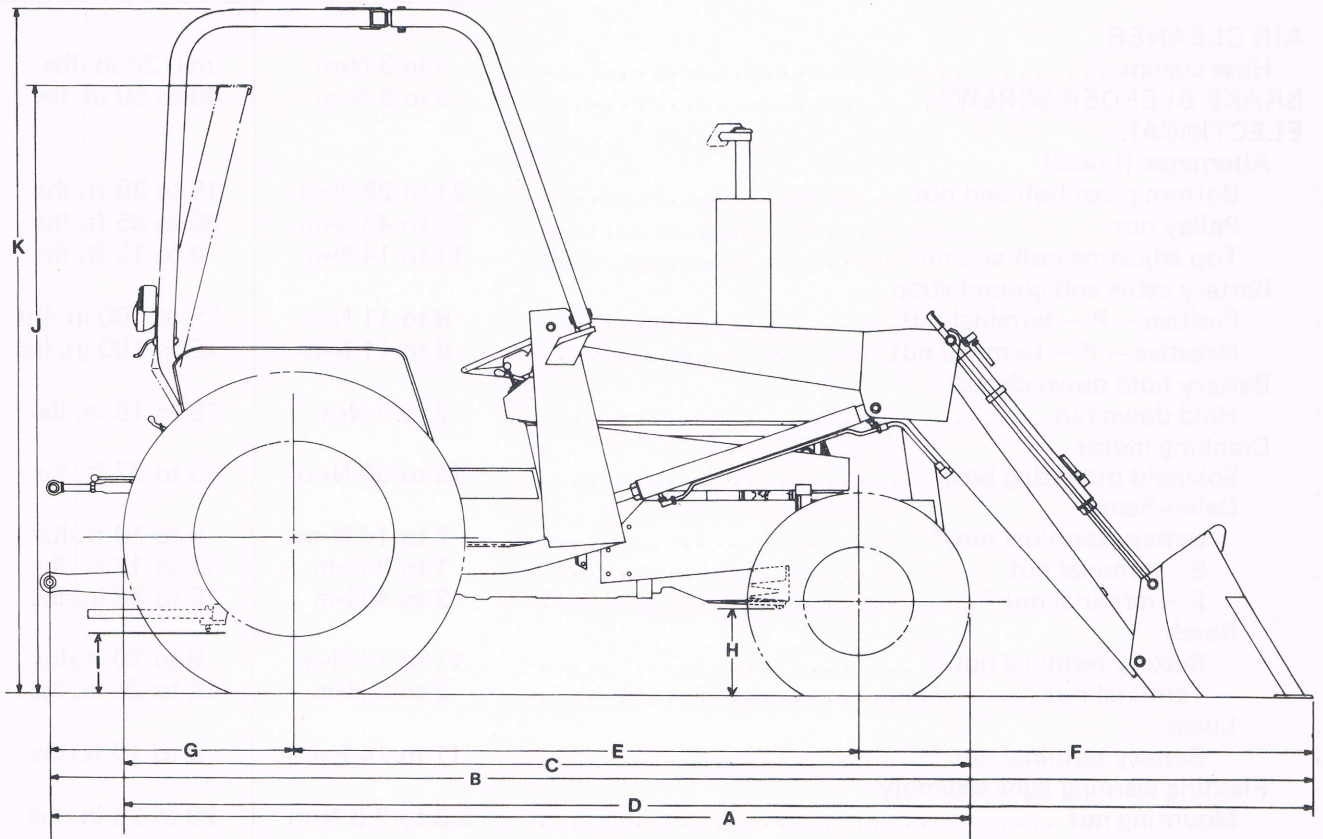
Stall torque ratio 2.54

Ground speed KPH (MPH) @ 2400 RPM engine speed.

TIRE	SIZE		14.9 x 24		14.9 x 28		16.9 x 24	
	TYPE		R4		R4		R4	
		GEAR	FWD	REV	FWD	REV	FWD	REV
RANGE	LO	1ST	3.15 (1.96)	3.96 (2.46)	3.38 (2.1)	4.26 (2.65)	3.27 (2.03)	4.12 (2.56)
		2ND	5.12 (3.18)	6.44 (4.0)	5.5 (3.42)	6.92 (4.3)	5.33 (3.31)	6.69 (4.16)
		3RD	6.92 (4.3)	8.7 (5.4)	7.43 (4.62)	9.35 (5.81)	7.19 (4.47)	9.04 (5.62)
	HI	1ST	12.07 (7.50)	—	12.97 (8.06)	—	12.55 (7.8)	—
		2ND	19.61 (12.19)	—	21.08 (13.1)	—	20.39 (12.67)	—
		3RD	26.52 (16.48)	—	28.5 (17.71)	—	27.56 (17.13)	—

GENERAL DIMENSIONS

PAY loader/PAY tractor (See NOTE 1)



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Fig. 2. PAY loader/PAY tractor Dimensions

A. Overall length with hitch (tractor) *	3.39 m	(133.8 in.)
B. Overall length with hitch (loader)	4.66 m	(183.5 in.)
C. Overall length without hitch (tractor) *		
D. Overall length without hitch (loader)	4.38 m	(172.6 in.)
E. Wheel base	2.08 m	(82.1 in.)
F. Centerline front tire to loader (loader)	1.66 m	(65.7 in.)
G. Centerline rear tire to hitch	0.90 m	(906.78 in.)
H. Engine drain plug height *	0.32 m	(12.85 in.)
I. Drawbar height *	2.27 m	(89.4 in.)
J. Two post ROPS height *	2.27 m	(89.4 in.)
K. Four post narrow ROPS height	2.53 m	(99.7 in.)
Four post wide ROPS height *		
Front wheel tread	1.41 m	(56.7 in.)

NOTE 1: PAY tractor dimensions based on unit with 7.50 x 16-8 ply F3 front tires and 14.9 x 24-6 ply R4 rear tires. PAY loader dimensions based on units with 7.50 x 16-8 ply F3 front tires and 14.9 x 24-6 ply R4 rear tires with 1.77 m (70 in.) bucket.

*Subtract 76 mm (3 in.) when equipped with Lo-Boy tire attachment.

SPECIFICATIONS AND CAPACITIES

SPECIAL TORQUES

APPLICATION	METRIC	U.S.
AIR CLEANER		
Hose clamps	min 3 N•m	min 23 in.-lbs
BRAKE BLEEDER SCREWS	5 to 6 N•m	40 to 50 in.-lbs
ELECTRICAL		
Alternator (Lucas)		
Bottom pivot bolt and nut	21 to 28 N•m	15 to 20 ft.-lbs
Pulley nut	28 to 48 N•m	20 to 35 ft.-lbs
Top adjusting bolt and nut	11 to 14 N•m	8 to 10 ft.-lbs
Battery cable and ground strap		
Positive — P — terminal nut	8 to 11 N•m	75 to 100 in.-lbs
Negative — P — terminal nut	8 to 11 N•m	75 to 100 in.-lbs
Battery hold down clamp		
Hold down nut	2 to 3 N•m	15 to 18 in.-lbs
Cranking motor		
Solenoid mounting bolts	45 to 50 N•m	33 to 37 ft.-lbs
Delco-Remy		
Battery terminal nut *	7 to 14 N•m	5 to 10 ft.-lbs
S — terminal nut	1 to 2 N•m	12 to 17 in.-lbs
R — terminal nut *	2 to 4 N•m	16 to 30 in.-lbs
Bosch		
Battery terminal nut *	11 to 14 N•m	8 to 10 ft.-lbs
Terminal nut *	2 to 3 N•m	15 to 20 in.-lbs
Lucas		
Battery terminal nut *	11 to 14 N•m	8 to 10 ft.-lbs
Flashing warning light assembly		
Mounting nut	2.3 to 2.8 N•m	20 to 25 in.-lbs
Fuel tank sending unit		
Mounting bolts	2 N•m	18 to 20 in.-lbs
Gauges		
Clamp mounting nut	max 1 N•m	5 to 8 in.-lbs
Charge indicator and fuel gauge terminal nut *	max 1 N•m	5 to 8 in.-lbs
Ammeter terminal nut *	1 to 2 N•m	10 to 15 in.-lbs
Junction block		
Terminal nut *	1 to 2 N•m	8 to 13 in.-lbs
Transmission oil pressure switch		
Terminal nut *	1.7 to 2.3 N•m	15 to 20 in.-lbs
ENGINE CYLINDER HEAD BOLTS	142 N•m	105 ft.-lbs
OIL FILTER CASE ON MCV	16 to 22 N•m	12 to 16 ft.-lbs
RESERVOIR DRAIN PLUG (3)	61 to 68 N•m	45 to 50 ft.-lbs
VALVE HOUSING COVER NUTS	5 N•m	4 ft.-lbs
WHEELS		
Rear wheels to hub bolts	298 to 325 N•m	220 to 240 ft.-lbs
Front wheel to hub bolts		
3.6 to 4.0 mm (0.14 to 0.16 in.) thick disc	108 to 136 N•m	80 to 100 ft.-lbs
4.6 to 5.6 mm (0.18 to 0.22 in.) thick disc	169 to 190 N•m	125 to 140 ft.-lbs

* Nut which fastens cable

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SHIPPING WEIGHTS (APPROXIMATE)

PAY[®] tractor

Hydrostatic transmission 2222 kg (4900 lbs)

Synchromesh transmission 2132 kg (4700 lbs)

PAY[®] loader







Hydrostatic transmission 2984 kg (6580 lbs)


Synchromesh transmission 2894 kg (6380 lbs)

Torque Convertor transmission 2984 kg (6580 lbs)

BOLT IDENTIFICATION CHARTS

U.S. BOLT TYPE IDENTIFICATION CHART

I.H. TYPE	S.A.E. GRADE	DESCRIPTION	BOLT HEAD MARKING *
1	Equivalent 1 or 2	WILL HAVE A  STANDARD MONOGRAM IN THE CENTER OF THE HEAD Low or Medium Carbon Steel Not Heat Treated	
5	5	WILL HAVE A  AND 3 RADIAL LINES Quenched and Tempered Medium Carbon Steel	
8	8	WILL HAVE A  AND 6 RADIAL LINES Quenched and Tempered Special Carbon or Alloy Steel	

*The center marking identifies the bolt manufacturer. The  monogram is currently used. Some bolts may still have an I.H. or a raised dot when previously identified I.H. bolts.

U.K. (BRITISH) BOLT TYPE IDENTIFICATION CHART

I.H. TYPE	BRITISH STANDARD INSTITUTE GRADE	BOLT HEAD MARKING					
5	S	TWLS	BEES 50-S-55	NEWALL HITENSILE "S"	SPNS	NEWTON S	SPARTS S
	T	TWLT	BEES 55-T-65	NEWALLOY T OR NEWALL HITENSILE "T"	SPNT	NEWTON T	SPARTS T
8	V	TWLV	BEES 65-V-75	NEWALLOY "V"	SPNV	NEWTON V	SPARTS V

SPECIFICATIONS AND CAPACITIES

STANDARD TORQUE DATA FOR NUTS AND BOLTS

TYPE 1, 5 AND 8 HARDWARE

Recommended torque, in foot pounds, for all Standard Application Nuts and Bolts, provided:

- A. All thread surfaces are clean and lubricated with SAE-20 engine oil. (See NOTE.)
- B. Joints are rigid, that is, no gaskets or compressible materials are used.
- C. When reusing nuts or bolts use minimum torque values.

NOTE: Multiply the standard torque by:

0.65 when finished jam nuts are used.

0.70 when Molykote, white lead or similar mixtures are used as lubricants.

0.75 when parkerized bolts or nuts are used.

0.85 when cadmium plated bolts or nuts and zinc bolts w/waxed zinc nuts are used.

0.90 when hardened surfaces are used under the nut or bolt head.

When reusing bolts and nuts in service, use minimum torque values.

BOLT SIZE	TYPE 1 STUDS ONLY				TYPE 1 6" LENGTH OR LESS				TYPE 1 LONGER THAN 6"			
	MIN.		MAX.		MIN.		MAX.		MIN.		MAX.	
	N•m	Ft-Lbs	N•m	Ft-Lbs	N•m	Ft-Lbs	N•m	Ft-Lbs	N•m	Ft-Lbs	N•m	Ft-Lbs
1/4	7	5	8	6	7	5	8	6	4	3	4	3
5/16	16	12	18	13	16	12	18	13	8	6	9	7
3/8	28	21	33	24	28	21	33	24	15	11	18	13
7/16	47	35	51	38	47	35	51	38	26	19	28	21
1/2	71	52	77	58	71	52	77	58	39	29	43	32
9/16	95	70	108	80	95	70	108	80	55	41	62	46
5/8	133	98	149	110	133	98	149	110	77	57	85	63
3/4	236	174	264	195	236	174	264	195	136	100	152	112
7/8	407	300	447	330	220	162	245	181	220	162	245	181
1	569	420	637	470	339	250	366	270	339	250	366	270
1-1/8	813	600	895	660	475	350	651	380	475	350	651	380
1-1/4	1139	840	1274	940	664	490	732	540	664	490	732	540
1-1/2	1993	1470	2224	1640	1152	850	1274	940	1152	850	1274	940
1-3/4	3186	2350	3322	2450	1803	1330	2020	1490	1803	1330	2020	1490
2	4745	3500	5288	3700	2712	2000	2983	2200	2712	2000	2438	2200

SPECIFICATIONS AND CAPACITIES

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BOLT SIZE	TYPE 5				TYPE 8				TYPE 8 - SPECIAL USE (SEE NOTE)			
	MIN.		MAX.		MIN.		MAX.		MIN.		MAX.	
	N•m	Ft-Lbs	N•m	Ft-Lbs	N•m	Ft-Lbs	N•m	Ft-Lbs	N•m	Ft-Lbs	N•m	Ft-Lbs
1/4	12	9	14	10	16	12	19	15	15	11	18	13
5/16	26	19	28	21	37	27	41	30	33	24	37	27
3/8	43	33	50	37	61	45	68	50	57	43	64	47
7/16	71	53	81	60	102	75	115	85	94	69	103	76
1/2	108	80	122	90	156	115	176	130	141	104	159	117
9/16	156	115	176	130	217	160	244	180	203	150	230	170
5/8	217	160	244	180	298	220	339	250	285	210	312	230
3/4	298	220	339	250	400	300	450	340	350	260	400	300
7/8	583	420	637	470	881	650	990	730	746	570	827	630
1	854	630	963	710	1315	970	2834	1090	1125	850	1261	950
1-1/8	1152	850	1288	950	3227	1380	3457	1550	1600	1220	1803	1350
1-1/4	1726	1200	1830	1350	3986	1940	5532	2180	2278	1700	2549	1900
1-1/2	5423	2000	5830	2300	8542	3300	9084	3700	8134	3000	8542	3300
1-3/4	8541	3300	9084	3700	13965	5300	16270	6000	11796	4700	12474	5200
2	13559	5000	14236	5500	21693	8000	24405	9000	18981	7000	20066	7800

NOTE: This column of torque represents maximum torques for capscrews in gray iron, when tread length engagement is at least 1-1/2 diameters.

TORQUE VALUES FOR TYPE 8 PHOSPHATED COATED HARDWARE

This chart provides tightening torque for applications as listed in the Parts Catalog for the machine involved. DO NOT SUBSTITUTE. Original equipment hardware defined as I.H. Type 8, coarse thread bolts and nuts and thru hardened flat washers (Rockwell "C" 38-45). All phosphate coated and assembled without supplemental lubrication (as received condition).

The torques shown below also apply to the following:

1. Phosphate coated bolts used in tapped holes in steel or gray iron.
2. Phosphate coated bolts used with phosphate coated prevailing torque nuts (nuts with distorted threads or plastic inserts).
3. Phosphate coated bolts used with copper plated weld nuts.

Markings on bolt heads or nuts indicate material

grade ONLY and are NOT to be used to determine required torque.

NOMINAL THREAD DIAMETER	STANDARD TORQUE $\pm 10\%$	
	NEWTON METERS	FOOT LBS.
1/4	10	7
5/16	19	14
3/8	32	24
7/16	51	38
1/2	80	60
9/16	110	80
5/8	155	115
3/4	270	200
7/8	440	320
1	650	480
1-1/8	800	590
1-1/4	1100	830
1-3/8	1500	1100
1-1/2	1900	1400
1-3/4	3100	2300
2	4600	3400

SPECIFICATIONS AND CAPACITIES

TORQUE VALUES FOR HOSE CLAMPS

(For special torque data, refer to "SPECIAL TORQUES" in Section 9)

The following chart provides the tightening torques for hose clamps used in all rubber applications (radiator, air cleaner, operating lever boots, hydraulic systems, etc.).

CLAMP TYPE & SIZE	TORQUE PLUS OR MINUS 5%			
	RADIATOR, AIR CLEANER, BOOTS, ETC.		HYDRAULIC SYSTEM	
	NEWTON METERS	INCH LBS.	NEWTON METERS	INCH LBS.
"T" Bolt (Any Diameter)	6.8	60	5.1	45
Worm Drive — 1-3/4" Open Diameter & Under	2.8	25	5.1	25
Worm Drive — Over 1-3/4" Open Diam- eter	5.1	45	5.1	45

TORQUE VALUES FOR SPLIT FLANGE CONNECTIONS

The following chart provides the tightening torques for split flange connections used in hydraulic systems. Split flanges and fitting shoulders should fit squarely. Install all bolts, finger tight and then torque evenly.

NOTE: Overtorquing bolts will damage the flanges and/or bolts, which may cause leakage.

FLANGE SIZE IN INCHES (*)	BOLT SIZE IN INCHES	BOLT TORQUE	
		NEWTON METERS	FOOT POUNDS
1/2	5/16	20-24	15-18
3/4	3/8	30-37	22-27
1	3/8	37-47	27-35
1-1/4	7/16	47-61	35-45
1-1/2	1/2	62-79	46-58
2	1/2	75-88	55-65
2-1/2	1/2	107-123	79-91
3	5/8	187-203	138-150
3-1/2	5/8	159-180	117-133

(*) Inside diameter of hydraulic tube or hose fitting.

TORQUE VALUES FOR TUBE NUTS (FOR 37° FLARED FITTINGS)

SIZE	TUBING O.D.	THREAD SIZE	TORQUE N•m		TORQUE FT-LBS	
			MIN.	MAX.	MIN.	MAX.
4	1/4	7/16-20	13.6	27.1	10	20
5	5/16	1/2-20	20.3	33.9	15	25
6	3/8	9/16-18	33.9	47.5	25	35
8	1/2	3/4-16	54.2	61.0	40	55
10	5/8	7/8-14	61.0	101.7	55	75
12	3/4	1-1/16-12	101.7	128.8	75	95
14	7/8	1-3/16-12	128.8	155.9	95	115
16	1	1-5/16-12	155.9	196.6	115	145
20	1-1/4	1-5/8-12	203.4	244.0	150	180
24	1-1/2	1-7/8-12	271.2	338.9	200	250
32	2	2-1/2-12	406.7	474.5	300	350

SPECIFICATIONS AND CAPACITIES

TORQUE VALUES FOR O-RING BOSS PLUGS, JIC 37° SEAT, SWIVEL NUTS

TORQUE N•m		TORQUE FT-LBS	
MIN.	MAX.	MIN.	MAX.
8.1	13.6	6	10
13.6	20.3	10	15
20.3	27.1	15	20
33.9	40.7	25	30
47.5	54.2	35	40
81.4	94.9	60	70
94.9	108.5	70	80
108.5	122.0	80	90
128.8	155.9	95	115
162.7	189.8	120	140
338.9	406.7	250	300

Above torque values are recommended for plain, cadmium or zinc plated fittings, dry or wet installations.

Swivel nuts either swaged or brazed.

These torques are not recommended for tubes with wall thickness of .035 or less.

Specifications subject to change without notice.

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